



Catalysis Science & Technology

Electronic Supplementary Information

Methane conversion into different hydrocarbons or oxygenates: Current status and future perspectives in catalyst development and reactor operation

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This PDF file includes:

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | p(CH ₄)/p(O ₂) | p _{total} , bar | X(O ₂), % | X(CH ₄), % | S(CO _x), % | S(C ₂ ⁻), % | S(C ₂ -), % | S(C ₂), % | Y(C ₂), % |
|--------------------------------|--|----------|--|--------------------------|-----------------------|------------------------|------------------------|------------------------------------|------------------------|-----------------------|-----------------------|
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 25.7 | 27.9 | | | 72.1 | 18.5 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 22.1 | 22.4 | | | 77.6 | 17.2 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 15.4 | 22.3 | | | 77.7 | 12.0 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 23.9 | 21.2 | | | 78.8 | 18.8 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 12.0 | 31.9 | | | 68.1 | 8.2 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 15.4 | 22.3 | | | 77.7 | 12.0 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 18.6 | 32.7 | | | 67.3 | 12.5 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 13.3 | 44.1 | | | 56.0 | 7.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 21.5 | 41.9 | | | 58.1 | 12.5 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 21.6 | 36.8 | | | 63.2 | 13.7 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 13.1 | 40.5 | | | 59.5 | 7.8 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 15.9 | 47.0 | | | 53.0 | 8.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 21.7 | 63.6 | | | 36.4 | 7.9 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 24.0 | 38.1 | | | 61.9 | 14.9 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 22.6 | 67.1 | | | 32.9 | 7.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 17.0 | 50.3 | | | 49.7 | 8.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 16.3 | 52.5 | | | 47.5 | 7.8 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 16.1 | 48.2 | | | 51.8 | 8.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 14.3 | 42.9 | | | 57.1 | 8.2 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 12.9 | 39.5 | | | 60.5 | 7.8 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 14.6 | 42.4 | | | 57.6 | 8.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 14.8 | 47.0 | | | 53.1 | 7.8 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 15.4 | 47.0 | | | 53.0 | 8.1 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 20.3 | 36.0 | | | 64.0 | 13.0 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 11.8 | 29.0 | | | 71.0 | 8.4 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 12.4 | 37.5 | | | 62.5 | 7.8 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 16.3 | 54.3 | | | 45.7 | 7.5 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 10.8 | 30.8 | | | 69.2 | 7.5 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 16.5 | 34.1 | | | 65.9 | 10.9 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 12.5 | 35.8 | | | 64.2 | 8.0 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 14.1 | 41.4 | | | 58.6 | 8.2 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 8.8 | 18.3 | | | 81.8 | 7.2 |
| Appl Catal A 219 (2001) 61-68 | Na-W-Zr-Mn-S-P | 1069 | 0.3 | 1.0 | | 12.8 | 39.1 | | | 60.9 | 7.8 |
| Appl Catal A 343(2008) 142-148 | Na-W-Mn/SiO ₂ | 1123 | 7.0 | 1.0 | | 42.0 | | | | 69.0 | 29.0 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ -ZnO/SiO ₂ | 873 | 7.5 | 1.0 | | 9.0 | 37.0 | | | 63.0 | 5.7 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ -CoOx/SiO ₂ | 873 | 7.5 | 1.0 | | 16.0 | 32.0 | | | 68.0 | 10.9 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ -FeOx/SiO ₂ | 873 | 7.5 | 1.0 | | 15.5 | 40.0 | | | 60.0 | 9.3 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ -MnOx/SiO ₂ | 873 | 7.5 | 1.0 | | 20.0 | 22.0 | | | 78.0 | 15.6 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ -CrOx/SiO ₂ | 873 | 7.5 | 1.0 | | 10.0 | 76.0 | | | 24.0 | 2.4 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ -VOx/SiO ₂ | 873 | 7.5 | 1.0 | | 10.0 | 88.0 | | | 12.0 | 1.2 |
| Catal Commu 9 (2008) 960-965 | Na ₂ WO ₄ /SiO ₂ | 873 | 7.5 | 1.0 | | 11.0 | 37.0 | | | 63.0 | 6.9 |
| Catal Commu 9 (2008) 1302-1306 | Na ₂ WO ₄ -Mn/SiO ₂ | 1023 | 4.0 | 1.0 | 99.4 | 26.3 | 39.9 | | | 56.2 | 14.8 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--------------------------------------|---------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|---------------------|---------------------|---------------------|
| Catal Commu 9 (2008) 1302-1306 | Na2WO4-Mn/SiC | 1023 | 4.0 | 1.0 | 76.9 | 21.5 | 42.5 | | | 51.9 | 11.2 |
| Chem Eng Sci 63 (2008) 4910-4916 | Na-W-Mn/SiO2 | 1073 | 4.0 | 1.0 | | 1.5 | 48.0 | 0.0 | 52.0 | 52.0 | 0.8 |
| Chem Eng Sci 63 (2008) 4910-4916 | Na-W-Mn/SiO2 | 1123 | 4.0 | 1.0 | | 2.2 | 93.0 | 0.0 | 7.0 | 7.0 | 0.2 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 1.0 | 1.0 | | 53.7 | 53.1 | | | 46.9 | 25.2 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 1.0 | 1.0 | | 65.4 | 65.2 | | | 34.8 | 22.8 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 1.0 | 1.0 | | 55.2 | 54.3 | | | 45.7 | 25.2 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.0 | 1.0 | | 32.0 | 38.0 | | | 62.0 | 19.9 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.0 | 1.0 | | 47.2 | 45.4 | | | 54.6 | 25.7 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.0 | 1.0 | | 44.2 | 44.9 | | | 55.1 | 24.3 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 3.0 | 1.0 | | 26.5 | 25.3 | | | 74.7 | 19.8 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 3.0 | 1.0 | | 32.9 | 35.6 | | | 64.4 | 21.2 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 3.0 | 1.0 | | 40.1 | 32.5 | | | 67.5 | 27.1 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 4.0 | 1.0 | | 26.0 | 24.1 | | | 75.9 | 19.8 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 4.0 | 1.0 | | 32.8 | 29.7 | | | 70.3 | 23.1 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 4.0 | 1.0 | | 19.8 | 29.2 | | | 70.8 | 14.0 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 7.5 | 1.0 | | 20.8 | 15.2 | | | 84.8 | 17.6 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 7.5 | 1.0 | | 25.2 | 22.2 | | | 77.8 | 19.6 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 7.5 | 1.0 | | 27.4 | 19.0 | | | 81.0 | 22.2 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.0 | 1.0 | | 37.3 | 38.6 | | | 61.4 | 22.9 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.0 | 1.0 | | 38.8 | 48.2 | | | 51.8 | 20.1 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.0 | 1.0 | | 35.3 | 48.1 | | | 51.9 | 18.3 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.5 | 1.0 | | 47.4 | 52.8 | | | 47.2 | 22.4 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.5 | 1.0 | | 31.8 | 64.5 | | | 35.5 | 11.3 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 2.5 | 1.0 | | 33.5 | 59.5 | | | 40.5 | 13.6 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 3.0 | 1.0 | | 30.2 | 40.5 | | | 59.5 | 18.0 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 3.0 | 1.0 | | 28.5 | 38.3 | | | 61.7 | 17.6 |
| Chem Prod Prco Model 3 (2008) 1-24 | Sr-Ba-Ti | 1023 | 3.0 | 1.0 | | 25.7 | 36.4 | | | 63.6 | 16.3 |
| Doklady Phys Chem 422 (2008) 253-255 | La-SiO2 | 1098 | 3.0 | 1.0 | 43.0 | 10.0 | 55.0 | 21.0 | 24.0 | 45.0 | 4.5 |
| Doklady Phys Chem 422 (2008) 253-255 | La-SiO2 | 1131 | 3.0 | 1.0 | 66.0 | 17.0 | 63.0 | 22.0 | 12.0 | 37.0 | 6.3 |
| Doklady Phys Chem 422 (2008) 253-255 | La-SiO2 | 1164 | 3.0 | 1.0 | 83.0 | 20.0 | 64.0 | 24.0 | 8.0 | 36.0 | 7.2 |
| Doklady Phys Chem 422 (2008) 253-255 | La-SiO2 | 1188 | 3.0 | 1.0 | 90.0 | 22.0 | 67.0 | 24.0 | 6.0 | 33.0 | 7.3 |
| Doklady Phys Chem 422 (2008) 253-255 | Ce-SiO2 | 1119 | 3.0 | 1.0 | 60.0 | 10.0 | 53.0 | 15.0 | 33.0 | 47.0 | 4.7 |
| Doklady Phys Chem 422 (2008) 253-255 | Ce-SiO2 | 1145 | 3.0 | 1.0 | 98.0 | 19.0 | 80.0 | 13.0 | 7.0 | 20.0 | 3.8 |
| Doklady Phys Chem 422 (2008) 253-255 | Ce-SiO2 | 1162 | 3.0 | 1.0 | 95.0 | 19.0 | 71.0 | 19.0 | 8.0 | 29.0 | 5.5 |
| Doklady Phys Chem 422 (2008) 253-255 | Ce-SiO2 | 1198 | 3.0 | 1.0 | 82.0 | 17.0 | 60.0 | 28.0 | 8.0 | 40.0 | 6.8 |
| Doklady Phys Chem 422 (2008) 253-255 | La-Ce-SiO2 | 1115 | 3.0 | 1.0 | 14.0 | 11.0 | 28.0 | 34.0 | 35.0 | 72.0 | 7.9 |
| Doklady Phys Chem 422 (2008) 253-255 | La-Ce-SiO2 | 1146 | 3.0 | 1.0 | 33.0 | 18.0 | 32.0 | 39.0 | 26.0 | 68.0 | 12.2 |
| Doklady Phys Chem 422 (2008) 253-255 | La-Ce-SiO2 | 1168 | 3.0 | 1.0 | 56.0 | 24.0 | 42.0 | 37.0 | 18.0 | 58.0 | 13.9 |
| Doklady Phys Chem 422 (2008) 253-255 | La-Ce-SiO2 | 1191 | 3.0 | 1.0 | 77.0 | 24.0 | 48.0 | 32.0 | 14.0 | 52.0 | 12.5 |
| J Mol Catal A 286 (2008) 79-86 | LSCF | 1073 | 3.2 | 1.0 | | 12.5 | 79.3 | | | 20.7 | 2.6 |
| J Mol Catal A 286 (2008) 79-86 | LSCF | 1098 | 3.2 | 1.0 | | 18.0 | 70.8 | | | 29.2 | 5.3 |
| J Mol Catal A 286 (2008) 79-86 | LSCF | 1123 | 3.2 | 1.0 | | 20.0 | 62.5 | | | 37.5 | 7.5 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| J Mol Catal A 286 (2008) 79-86 | LSCF | 1153 | 3.2 | 1.0 | | 22.0 | 67.7 | | | 32.3 | 7.1 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 923 | 2.0 | 1.0 | | 12.2 | 34.4 | | | 65.6 | 8.0 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 973 | 2.0 | 1.0 | | 20.1 | 36.0 | | | 64.0 | 12.9 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1073 | 2.0 | 1.0 | | 49.0 | 42.0 | | | 58.0 | 28.4 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 1.0 | 1.0 | | 46.2 | 41.8 | | | 58.2 | 26.9 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 2.0 | 1.0 | | 43.8 | 36.2 | | | 63.8 | 27.9 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 3.0 | 1.0 | | 32.9 | 35.7 | | | 64.3 | 21.2 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 4.0 | 1.0 | | 31.1 | 29.7 | | | 70.3 | 21.8 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 7.5 | 1.0 | | 25.2 | 22.2 | | | 77.8 | 19.6 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 1.0 | 1.0 | | 55.2 | 54.3 | | | 45.7 | 25.2 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 2.0 | 1.0 | | 44.2 | 44.9 | | | 55.1 | 24.3 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 3.0 | 1.0 | | 35.8 | 38.0 | | | 62.0 | 22.2 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 4.0 | 1.0 | | 32.1 | 33.0 | | | 67.0 | 21.5 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 7.5 | 1.0 | | 29.9 | 20.4 | | | 79.7 | 23.8 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 1.0 | 1.0 | | 49.4 | 34.0 | | | 66.0 | 32.6 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 2.0 | 1.0 | | 39.3 | 30.0 | | | 70.0 | 27.5 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 3.0 | 1.0 | | 26.5 | 27.3 | | | 72.7 | 19.3 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 4.0 | 1.0 | | 26.0 | 24.1 | | | 75.9 | 19.7 |
| J Nat Gas Chem 17 (2008) 8-16 | Sn-Ba-Ti | 1048 | 7.5 | 1.0 | | 20.8 | 15.6 | | | 84.4 | 17.5 |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 8.2 | 1.0 | | 1.4 | | 57.7 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 7.1 | 1.0 | | 1.7 | | 55.6 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 6.0 | 1.0 | | 1.9 | | 52.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 5.0 | 1.0 | | 2.2 | | 51.6 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 4.1 | 1.0 | | 2.5 | | 53.4 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 3.1 | 1.0 | | 2.7 | | 48.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 2.1 | 1.0 | | 2.8 | | 43.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 7.4 | 1.0 | | 1.7 | | 37.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 5.3 | 1.0 | | 2.0 | | 43.5 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 3.2 | 1.0 | | 2.7 | | 50.3 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 2.4 | 1.0 | | 3.1 | | 43.6 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1073 | 2.1 | 1.0 | | 3.5 | | 34.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 8.2 | 1.0 | | 2.2 | | 50.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 7.1 | 1.0 | | 2.6 | | 46.9 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 6.0 | 1.0 | | 2.9 | | 49.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 5.0 | 1.0 | | 3.3 | | 47.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 4.1 | 1.0 | | 3.9 | | 42.9 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 3.1 | 1.0 | | 4.7 | | 41.3 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 2.1 | 1.0 | | 4.9 | | 31.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 7.4 | 1.0 | | 2.3 | | 43.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 5.3 | 1.0 | | 2.6 | | 45.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 3.2 | 1.0 | | 3.2 | | 51.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 2.4 | 1.0 | | 3.7 | | 43.4 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1098 | 2.1 | 1.0 | | 4.2 | | 39.2 | | | |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 8.2 | 1.0 | | 2.6 | | 52.6 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 7.1 | 1.0 | | 3.0 | | 52.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 6.0 | 1.0 | | 3.4 | | 53.6 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 5.0 | 1.0 | | 4.0 | | 52.9 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 4.1 | 1.0 | | 4.8 | | 52.9 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 3.1 | 1.0 | | 5.3 | | 52.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 2.1 | 1.0 | | 6.2 | | 49.8 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 7.4 | 1.0 | | 2.7 | | 46.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 5.3 | 1.0 | | 3.7 | | 41.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 3.2 | 1.0 | | 5.7 | | 50.8 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 2.4 | 1.0 | | 7.2 | | 39.7 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1123 | 2.1 | 1.0 | | 8.6 | | 29.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 8.2 | 1.0 | | 3.5 | | 48.4 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 7.1 | 1.0 | | 4.1 | | 47.4 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 6.0 | 1.0 | | 4.7 | | 45.8 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 5.0 | 1.0 | | 5.6 | | 47.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 4.1 | 1.0 | | 6.5 | | 46.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 3.1 | 1.0 | | 7.5 | | 45.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 2.1 | 1.0 | | 7.6 | | 44.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 7.4 | 1.0 | | 3.4 | | 35.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 5.3 | 1.0 | | 4.8 | | 37.7 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 3.2 | 1.0 | | 7.3 | | 42.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 2.4 | 1.0 | | 9.8 | | 31.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1153 | 2.1 | 1.0 | | 12.0 | | 25.5 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 8.2 | 1.0 | | 4.4 | | 41.8 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 7.1 | 1.0 | | 4.7 | | 46.1 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 6.0 | 1.0 | | 5.4 | | 45.3 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 5.0 | 1.0 | | 6.3 | | 43.7 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 4.1 | 1.0 | | 6.8 | | 42.9 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 3.1 | 1.0 | | 7.5 | | 40.3 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 2.1 | 1.0 | | 8.8 | | 36.9 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 7.4 | 1.0 | | 4.4 | | 35.5 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 5.3 | 1.0 | | 5.7 | | 39.2 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 3.2 | 1.0 | | 8.4 | | 37.0 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 2.4 | 1.0 | | 11.5 | | 26.8 | | | |
| Appl Catal A 354 (2009) 143-152 | La-Sr-Co-Fe-O3 | 1173 | 2.1 | 1.0 | | 13.5 | | 21.5 | | | |
| Catal Commu 10 (2009) 807-810 | SrCO3/Sm2O3 | 473 | 2.5 | 1.0 | | 34.9 | 64.3 | 19.7 | 16.0 | 35.7 | 12.5 |
| Catal Commu 10 (2009) 807-810 | SrCO3/Sm2O3 | 473 | 2.5 | 1.0 | | 35.0 | 63.9 | 18.5 | 17.6 | 36.1 | 12.6 |
| Catal Commu 10 (2009) 807-810 | SrCO3/Sm2O3 | 473 | 2.5 | 1.0 | | 37.4 | 60.4 | 21.9 | 17.7 | 39.6 | 14.8 |
| Catal Commu 10 (2009) 807-810 | SrCO3/Sm2O3 | 473 | 2.5 | 1.0 | | 30.7 | 70.0 | 15.5 | 14.5 | 30.0 | 9.2 |
| Catal Commu 10 (2009) 807-810 | Sm2O3 | 473 | 2.5 | 1.0 | | 29.3 | 75.5 | 10.8 | 13.7 | 24.5 | 7.2 |
| Catal Lett 129 (2009) 156-162 | ZrO2 | 873 | 2.0 | 1.0 | | 23.6 | 73.2 | 15.1 | 11.7 | 26.8 | 6.3 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 623 | 2.0 | 1.0 | | 38.2 | 72.4 | 17.8 | 9.8 | 27.6 | 10.5 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|----------------------------------|-------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 623 | 2.0 | 1.0 | | 38.5 | 70.3 | 18.9 | 10.8 | 29.7 | 11.4 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 623 | 2.0 | 1.0 | | 39.2 | 69.9 | 19.8 | 10.3 | 30.1 | 11.8 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 623 | 2.0 | 1.0 | | 36.1 | 68.5 | 20.2 | 11.3 | 31.5 | 11.4 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 623 | 2.0 | 1.0 | | 32.7 | 67.8 | 20.9 | 11.3 | 32.2 | 10.5 |
| Catal Lett 129 (2009) 156-162 | BaCO3 | 1023 | 2.0 | 1.0 | | 4.9 | 48.9 | 13.7 | 37.4 | 51.1 | 2.5 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 723 | 2.0 | 1.0 | | 39.2 | 69.9 | 19.8 | 10.3 | 30.1 | 11.8 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 723 | 2.5 | 1.0 | | 33.4 | 67.3 | 19.4 | 13.3 | 32.7 | 10.9 |
| Catal Lett 129 (2009) 156-162 | BaCO3/ZrO2 | 723 | 3.0 | 1.0 | | 28.7 | 63.9 | 18.9 | 17.2 | 36.1 | 10.4 |
| Catal Lett 131 (2009) 258-265 | ZnO with defects | 973 | 4.0 | 1.0 | 100.0 | 18.0 | 76.0 | | | 24.0 | 4.3 |
| Catal Lett 131 (2009) 258-265 | ZnO Commercial | 973 | 4.0 | 1.0 | 100.0 | 17.5 | 78.0 | | | 22.0 | 3.9 |
| Catal Lett 131 (2009) 258-265 | ZnO Calcinated | 973 | 4.0 | 1.0 | 18.0 | 3.0 | 79.0 | | | 21.0 | 0.6 |
| Catal Lett 131 (2009) 258-265 | Li@ZnO | 973 | 4.0 | 1.0 | 22.0 | 3.5 | 85.0 | | | 15.0 | 0.5 |
| Catal Lett 131 (2009) 258-265 | Li@ZnO | 973 | 4.0 | 1.0 | 22.0 | 5.0 | 65.0 | | | 35.0 | 1.8 |
| Catal Lett 131 (2009) 258-265 | Li@ZnO | 973 | 4.0 | 1.0 | 43.0 | 6.0 | 90.0 | | | 10.0 | 0.6 |
| Catal Lett 131 (2009) 258-265 | Li-ZnO | 973 | 4.0 | 1.0 | 60.0 | 9.0 | 80.0 | | | 20.0 | 1.8 |
| Catal Lett 131 (2009) 258-265 | Li-ZnO | 973 | 4.0 | 1.0 | 50.0 | 8.0 | 75.0 | | | 25.0 | 2.0 |
| Catal Lett 131 (2009) 258-265 | Li-ZnO | 973 | 4.0 | 1.0 | 22.0 | 6.0 | 55.0 | | | 45.0 | 2.7 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1073 | 1.0 | 1.0 | | 25.0 | 57.0 | | | 43.0 | 10.8 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1123 | 1.0 | 1.0 | | 22.0 | 45.0 | | | 55.0 | 12.1 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1173 | 1.0 | 1.0 | | 23.0 | 37.0 | | | 63.0 | 14.5 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1223 | 1.0 | 1.0 | | 26.0 | 36.0 | | | 64.0 | 16.6 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1273 | 1.0 | 1.0 | | 32.0 | 42.0 | | | 58.0 | 18.6 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1073 | 1.7 | 1.0 | | 23.0 | 51.0 | | | 49.0 | 11.3 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1123 | 1.7 | 1.0 | | 24.0 | 46.0 | | | 54.0 | 13.0 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1173 | 1.7 | 1.0 | | 24.0 | 35.0 | | | 65.0 | 15.6 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1223 | 1.7 | 1.0 | | 26.0 | 39.0 | | | 61.0 | 15.9 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1273 | 1.7 | 1.0 | | 27.0 | 50.0 | | | 50.0 | 13.5 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1073 | 3.1 | 1.0 | | 25.0 | 49.0 | | | 51.0 | 12.8 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1123 | 3.1 | 1.0 | | 24.0 | 33.0 | | | 67.0 | 16.1 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1173 | 3.1 | 1.0 | | 25.0 | 30.0 | | | 70.0 | 17.5 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1223 | 3.1 | 1.0 | | 28.0 | 34.0 | | | 66.0 | 18.5 |
| Catalysis Today 142 (2009) 34-41 | LaSr/CaO on BSCFO | 1273 | 3.1 | 1.0 | | 30.0 | 47.0 | | | 53.0 | 15.9 |
| Catalysis Today 145 (2009) 45-54 | Li/MgO | 1073 | 4.0 | 1.0 | 80.5 | 19.1 | 44.5 | | | 55.5 | 10.6 |
| Catalysis Today 145 (2009) 45-54 | Na/MgO | 1073 | 4.0 | 1.0 | 81.1 | 27.1 | 48.0 | | | 52.0 | 14.1 |
| Catalysis Today 145 (2009) 45-54 | Na/CaO | 1073 | 4.0 | 1.0 | 94.8 | 25.0 | 56.4 | | | 43.6 | 10.9 |
| Catalysis Today 145 (2009) 45-54 | Na/CaO | 1073 | 4.0 | 1.0 | 95.0 | 24.8 | 54.0 | | | 46.0 | 11.4 |
| Catalysis Today 145 (2009) 45-54 | Li/La2O3 | 1073 | 4.0 | 1.0 | 82.1 | 24.1 | 45.6 | | | 54.4 | 13.1 |
| Catalysis Today 145 (2009) 45-54 | Li/La2O3-MgO | 1073 | 4.0 | 1.0 | 92.4 | 28.5 | 47.0 | | | 53.0 | 15.1 |
| Catalysis Today 145 (2009) 45-54 | Li/NiO-TiO2 | 1073 | 4.0 | 1.0 | 67.0 | 23.8 | 54.2 | | | 45.8 | 10.9 |
| Catalysis Today 145 (2009) 45-54 | Na/NiO-TiO2 | 1073 | 4.0 | 1.0 | 60.3 | 15.3 | 52.4 | | | 47.6 | 7.3 |
| Catalysis Today 145 (2009) 45-54 | Li/MgO | 1073 | 4.0 | 1.0 | 72.4 | 2.1 | 27.6 | | | 72.4 | 1.5 |
| Catalysis Today 145 (2009) 45-54 | Li/La2O3 | 1073 | 4.0 | 1.0 | 59.9 | 22.2 | 40.1 | | | 59.9 | 13.3 |
| Catalysis Today 145 (2009) 45-54 | Li/La2O3-MgO | 1073 | 4.0 | 1.0 | 88.0 | 25.8 | 35.7 | | | 64.3 | 16.6 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|-------------------------------------|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Chem Eng Journal 148 (2009) 525-532 | Na-W-Mn/BCGCF | 1123 | 3.0 | | | 51.6 | 32.6 | 33.7 | 33.7 | 67.4 | 34.8 |
| Energy Fuels 23 (2009) 613-616 | La2O3 | 1023 | 10.0 | 1.0 | 32.2 | | 35.1 | | | 64.9 | |
| Energy Fuels 23 (2009) 613-616 | La-FeO3 | 1023 | 10.0 | 1.0 | 86.5 | | 97.9 | | | 2.1 | |
| Energy Fuels 23 (2009) 613-616 | La-CoO3 | 1023 | 10.0 | 1.0 | 86.0 | | 99.6 | | | 0.4 | |
| Energy Fuels 23 (2009) 613-616 | La-MnO3 | 1023 | 10.0 | 1.0 | 83.0 | | 99.4 | | | 0.6 | |
| Energy Fuels 23 (2009) 613-616 | La-CrO3 | 1023 | 10.0 | 1.0 | 76.3 | | 100.0 | | | 0.0 | |
| Energy Fuels 23 (2009) 613-616 | La-NiO | 1023 | 10.0 | 1.0 | 7.2 | | 100.0 | | | 0.0 | |
| Energy Fuels 23 (2009) 613-616 | La-FeO3 | 1023 | 10.0 | 1.0 | 85.7 | | 61.5 | | | 38.5 | |
| Energy Fuels 23 (2009) 613-616 | La-CoO3 | 1023 | 10.0 | 1.0 | 86.8 | | 96.6 | | | 3.4 | |
| Energy Fuels 23 (2009) 613-616 | La-MnO3 | 1023 | 10.0 | 1.0 | 90.6 | | 87.7 | | | 12.3 | |
| Energy Fuels 23 (2009) 613-616 | La-CrO3 | 1023 | 10.0 | 1.0 | 89.7 | | 98.6 | | | 1.4 | |
| Energy Fuels 23 (2009) 613-616 | La-NiO | 1023 | 10.0 | 1.0 | 96.2 | | 99.4 | | | 0.6 | |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1048 | 7.5 | 1.0 | | 11.0 | 29.0 | 30.0 | 41.0 | 71.0 | 7.8 |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1073 | 7.5 | 1.0 | | 13.0 | 24.0 | 36.0 | 40.0 | 76.0 | 9.9 |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1098 | 7.5 | 1.0 | | 13.5 | 25.0 | 40.0 | 35.0 | 75.0 | 10.1 |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1123 | 7.5 | 1.0 | | 14.0 | 24.0 | 42.0 | 34.0 | 76.0 | 10.6 |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1148 | 7.5 | 1.0 | | 15.5 | 34.0 | 44.0 | 22.0 | 66.0 | 10.2 |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1073 | 3.0 | 1.0 | | | 40.0 | 42.0 | 18.0 | 60.0 | |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1073 | 5.0 | 1.0 | | | 30.0 | 40.0 | 30.0 | 70.0 | |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1073 | 6.0 | 1.0 | | | 25.0 | 40.0 | 35.0 | 75.0 | |
| Fuel Proc Techn 90 (2009) 403-410 | Na2WO4/Mn/SiO2 | 1073 | 9.0 | 1.0 | | | 16.0 | 42.5 | 41.5 | 84.0 | |
| Ind Eng Chem Res 48 (2009) 641-646 | Nd-Sr-Fe-Ce | 973 | 2.5 | 1.0 | | 12.9 | 96.4 | 0.4 | 3.2 | 3.6 | 0.5 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Sr-Fe-Ce | 973 | 2.5 | 1.0 | | 11.1 | 96.3 | 0.4 | 3.3 | 3.7 | 0.4 |
| Ind Eng Chem Res 48 (2009) 641-646 | Pr-Sr-Fe-Ce | 973 | 2.5 | 1.0 | | 12.3 | 94.5 | 0.8 | 4.8 | 5.6 | 0.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Sr-Fe-Ce | 973 | 2.5 | 1.0 | | 11.5 | 94.8 | 0.8 | 4.4 | 5.2 | 0.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Fe-Ce | 973 | 2.5 | 1.0 | | 11.8 | 96.8 | 0.4 | 2.9 | 3.2 | 0.4 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Mn | 973 | 2.5 | 1.0 | | 11.8 | 98.9 | 0.0 | 1.2 | 1.2 | 0.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Cr | 973 | 2.5 | 1.0 | | 11.2 | 99.7 | 0.0 | 0.3 | 0.3 | 0.0 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Na-Mn | 973 | 2.5 | 1.0 | | 9.4 | 81.9 | 3.3 | 14.8 | 18.1 | 1.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Na-Mn | 973 | 2.5 | 1.0 | | 4.7 | 78.0 | 6.8 | 15.2 | 22.0 | 1.0 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Na-Mn | 973 | 2.5 | 1.0 | | 6.0 | 53.6 | 20.5 | 25.9 | 46.4 | 2.8 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-La-Co | 973 | 2.5 | 1.0 | | 3.4 | 53.8 | 11.2 | 35.0 | 46.2 | 1.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Gd-Co | 973 | 2.5 | 1.0 | | 5.7 | 52.7 | 17.6 | 29.7 | 47.3 | 2.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Sm-Co | 973 | 2.5 | 1.0 | | 3.3 | 76.4 | 4.1 | 19.5 | 23.6 | 0.8 |
| Ind Eng Chem Res 48 (2009) 641-646 | Nd-Sr-Fe-Ce | 993 | 2.5 | 1.0 | | 13.1 | 95.2 | 0.7 | 4.1 | 4.8 | 0.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Sr-Fe-Ce | 993 | 2.5 | 1.0 | | 11.9 | 94.6 | 0.8 | 4.6 | 5.4 | 0.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | Pr-Sr-Fe-Ce | 993 | 2.5 | 1.0 | | 12.4 | 93.6 | 1.0 | 5.4 | 6.4 | 0.8 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Sr-Fe-Ce | 993 | 2.5 | 1.0 | | 12.3 | 93.9 | 1.0 | 5.1 | 6.1 | 0.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Fe-Ce | 993 | 2.5 | 1.0 | | 12.1 | 95.3 | 0.7 | 4.0 | 4.7 | 0.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Mn | 993 | 2.5 | 1.0 | | 11.9 | 98.2 | 0.1 | 1.7 | 1.8 | 0.2 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Cr | 993 | 2.5 | 1.0 | | 11.6 | 99.5 | 0.0 | 0.5 | 0.5 | 0.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Na-Mn | 993 | 2.5 | 1.0 | | 10.3 | 74.5 | 6.8 | 18.7 | 25.5 | 2.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Na-Mn | 993 | 2.5 | 1.0 | | 6.5 | 73.3 | 8.9 | 17.8 | 26.7 | 1.7 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|------------------------------------|-------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Na-Mn | 993 | 2.5 | 1.0 | | 9.5 | 48.0 | 25.4 | 26.6 | 52.0 | 4.9 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-La-Co | 993 | 2.5 | 1.0 | | 5.1 | 47.1 | 17.3 | 35.6 | 52.9 | 2.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Gd-Co | 993 | 2.5 | 1.0 | | 6.8 | 47.0 | 21.7 | 31.3 | 53.0 | 3.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Sm-Co | 993 | 2.5 | 1.0 | | 4.6 | 67.5 | 8.1 | 24.4 | 32.5 | 1.5 |
| Ind Eng Chem Res 48 (2009) 641-646 | Nd-Sr-Fe-Ce | 1013 | 2.5 | 1.0 | | 14.3 | 94.1 | 1.0 | 4.9 | 5.9 | 0.8 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Sr-Fe-Ce | 1013 | 2.5 | 1.0 | | 13.4 | 93.3 | 1.3 | 5.4 | 6.8 | 0.9 |
| Ind Eng Chem Res 48 (2009) 641-646 | Pr-Sr-Fe-Ce | 1013 | 2.5 | 1.0 | | 13.0 | 92.7 | 1.4 | 6.0 | 7.3 | 1.0 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Sr-Fe-Ce | 1013 | 2.5 | 1.0 | | 12.4 | 91.2 | 1.8 | 7.0 | 8.8 | 1.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Fe-Ce | 1013 | 2.5 | 1.0 | | 12.6 | 94.1 | 1.1 | 4.8 | 5.9 | 0.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Mn | 1013 | 2.5 | 1.0 | | 12.2 | 97.3 | 0.3 | 2.4 | 2.7 | 0.3 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Cr | 1013 | 2.5 | 1.0 | | 12.4 | 99.3 | 0.0 | 0.7 | 0.7 | 0.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Na-Mn | 1013 | 2.5 | 1.0 | | 11.5 | 70.5 | 9.1 | 20.4 | 29.5 | 3.4 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Na-Mn | 1013 | 2.5 | 1.0 | | 9.3 | 68.6 | 12.2 | 19.2 | 31.4 | 2.9 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Na-Mn | 1013 | 2.5 | 1.0 | | 11.2 | 45.5 | 31.8 | 22.7 | 54.5 | 6.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-La-Co | 1013 | 2.5 | 1.0 | | 7.0 | 41.2 | 25.0 | 33.8 | 58.8 | 4.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Gd-Co | 1013 | 2.5 | 1.0 | | 9.1 | 41.6 | 29.4 | 29.0 | 58.4 | 5.3 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Sm-Co | 1013 | 2.5 | 1.0 | | 7.8 | 59.4 | 14.8 | 25.8 | 40.6 | 3.2 |
| Ind Eng Chem Res 48 (2009) 641-646 | Nd-Sr-Fe-Ce | 1033 | 2.5 | 1.0 | | 14.9 | 92.8 | 1.5 | 5.7 | 7.2 | 1.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Sr-Fe-Ce | 1033 | 2.5 | 1.0 | | 14.6 | 91.3 | 2.0 | 6.6 | 8.7 | 1.3 |
| Ind Eng Chem Res 48 (2009) 641-646 | Pr-Sr-Fe-Ce | 1033 | 2.5 | 1.0 | | 13.5 | 91.0 | 2.1 | 6.9 | 9.0 | 1.2 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Sr-Fe-Ce | 1033 | 2.5 | 1.0 | | 13.0 | 88.3 | 3.7 | 8.0 | 11.7 | 1.5 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Fe-Ce | 1033 | 2.5 | 1.0 | | 13.6 | 92.7 | 1.7 | 5.6 | 7.3 | 1.0 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Mn | 1033 | 2.5 | 1.0 | | 13.0 | 96.2 | 0.8 | 3.1 | 3.8 | 0.5 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Cr | 1033 | 2.5 | 1.0 | | 12.6 | 98.6 | 0.2 | 1.2 | 1.4 | 0.2 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Na-Mn | 1033 | 2.5 | 1.0 | | 14.2 | 57.3 | 15.8 | 26.9 | 42.7 | 6.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Na-Mn | 1033 | 2.5 | 1.0 | | 10.7 | 67.5 | 14.0 | 18.5 | 32.5 | 3.5 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Na-Mn | 1033 | 2.5 | 1.0 | | 15.5 | 43.8 | 34.8 | 21.4 | 56.2 | 8.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-La-Co | 1033 | 2.5 | 1.0 | | 9.1 | 35.4 | 34.6 | 30.0 | 64.6 | 5.9 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Gd-Co | 1033 | 2.5 | 1.0 | | 13.7 | 38.7 | 34.3 | 27.0 | 61.3 | 8.4 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Sm-Co | 1033 | 2.5 | 1.0 | | 9.5 | 54.4 | 22.0 | 23.6 | 45.6 | 4.3 |
| Ind Eng Chem Res 48 (2009) 641-646 | Nd-Sr-Fe-Ce | 1053 | 2.5 | 1.0 | | 15.3 | 90.9 | 2.2 | 6.9 | 9.1 | 1.4 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Sr-Fe-Ce | 1053 | 2.5 | 1.0 | | 15.5 | 89.3 | 2.9 | 7.8 | 10.8 | 1.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | Pr-Sr-Fe-Ce | 1053 | 2.5 | 1.0 | | 14.3 | 88.7 | 3.1 | 8.2 | 11.3 | 1.6 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Sr-Fe-Ce | 1053 | 2.5 | 1.0 | | 14.5 | 82.9 | 6.0 | 11.2 | 17.1 | 2.5 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Fe-Ce | 1053 | 2.5 | 1.0 | | 13.8 | 91.0 | 2.7 | 6.3 | 9.0 | 1.2 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Mn | 1053 | 2.5 | 1.0 | | 13.9 | 94.6 | 1.3 | 4.1 | 5.4 | 0.7 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Sr-Cr | 1053 | 2.5 | 1.0 | | 13.3 | 97.9 | 0.4 | 1.7 | 2.1 | 0.3 |
| Ind Eng Chem Res 48 (2009) 641-646 | La-Na-Mn | 1053 | 2.5 | 1.0 | | 15.1 | 52.9 | 21.7 | 25.4 | 47.1 | 7.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Gd-Na-Mn | 1053 | 2.5 | 1.0 | | 11.3 | 64.1 | 18.1 | 17.8 | 35.9 | 4.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Sm-Na-Mn | 1053 | 2.5 | 1.0 | | 17.2 | 42.5 | 39.1 | 18.4 | 57.5 | 9.9 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-La-Co | 1053 | 2.5 | 1.0 | | 11.9 | 31.6 | 41.1 | 27.3 | 68.4 | 8.1 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Gd-Co | 1053 | 2.5 | 1.0 | | 17.0 | 36.0 | 38.3 | 25.7 | 64.0 | 10.9 |
| Ind Eng Chem Res 48 (2009) 641-646 | Na-Sm-Co | 1053 | 2.5 | 1.0 | | 13.2 | 45.4 | 27.6 | 27.0 | 54.6 | 7.2 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--------------------------------------|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Mendelev Comm 19 (2009) 337-339 | Na2WO4/Mn/SiO2 | 973 | 7.4 | 1.0 | 33.5 | 3.0 | 67.7 | 11.1 | 21.2 | 32.3 | 1.0 |
| Mendelev Comm 19 (2009) 337-339 | Na2WO4/Mn/SiO2 | 1023 | 7.4 | 1.0 | 66.4 | 7.9 | 44.1 | 33.1 | 22.8 | 55.9 | 4.4 |
| Mendelev Comm 19 (2009) 337-339 | Na2WO4/Mn/SiO2 | 1073 | 7.4 | 1.0 | 91.2 | 12.2 | 36.5 | 46.1 | 17.4 | 63.5 | 7.8 |
| AIChE Journal 56 (2010) 717 | MgLi/Al2O3 | 1023 | 1.6 | 1.0 | | 19.0 | | | | 40.0 | 7.6 |
| AIChE Journal 56 (2010) 717 | MgLi/Al2O3 | 1023 | 1.6 | 1.0 | | 15.0 | | | | 34.0 | 5.1 |
| AIChE Journal 56 (2010) 717 | MgLi/Al2O3 | 1023 | 1.6 | 1.0 | | 38.0 | | | | 66.0 | 25.1 |
| AIChE Journal 56 (2010) 717 | MgLi/Al2O3 | 1023 | 1.6 | 1.0 | | 36.0 | | | | 63.0 | 22.7 |
| Appl Catal A 375(2010) 172-178 | BeO-Nd2O3 | 1048 | 5.0 | 1.0 | | 21.3 | 59.3 | | | 40.7 | 8.6 |
| Appl Catal A 375(2010) 172-178 | MgO-Nd2O3 | 1048 | 5.0 | 1.0 | | 21.4 | 51.3 | | | 48.7 | 10.4 |
| Appl Catal A 375(2010) 172-178 | CaO-Nd2O3 | 1048 | 5.0 | 1.0 | | 23.1 | 48.0 | | | 52.0 | 11.8 |
| Appl Catal A 375(2010) 172-178 | SrO-Nd2O3 | 1048 | 5.0 | 1.0 | | 20.4 | 50.8 | | | 49.2 | 10.2 |
| Catal Lett 135 (2010) 26-32 | Li/MgO | 973 | 5.0 | 1.0 | | 5.5 | 63.5 | | | 36.5 | 2.0 |
| Catal Lett 135 (2010) 26-32 | Li/MgO | 1023 | 5.0 | 1.0 | | 11.2 | 52.5 | | | 47.5 | 5.3 |
| Catal Lett 135 (2010) 26-32 | Li/MgO | 1073 | 5.0 | 1.0 | | 17.0 | 44.0 | | | 56.0 | 9.5 |
| Catal Lett 135 (2010) 26-32 | Na/MgO | 973 | 5.0 | 1.0 | | 1.0 | 68.0 | | | 32.0 | 0.3 |
| Catal Lett 135 (2010) 26-32 | Na/MgO | 1023 | 5.0 | 1.0 | | 3.5 | 60.0 | | | 40.0 | 1.4 |
| Catal Lett 135 (2010) 26-32 | Na/MgO | 1073 | 5.0 | 1.0 | | 10.0 | 56.0 | | | 44.0 | 4.4 |
| Catal Lett 135 (2010) 26-32 | Li/Ce/MgO | 973 | 5.0 | 1.0 | | 7.0 | 46.0 | | | 54.0 | 3.8 |
| Catal Lett 135 (2010) 26-32 | Li/Ce/MgO | 1023 | 5.0 | 1.0 | | 13.0 | 42.0 | | | 58.0 | 7.5 |
| Catal Lett 135 (2010) 26-32 | Li/Ce/MgO | 1073 | 5.0 | 1.0 | | 21.5 | 36.0 | | | 64.0 | 13.8 |
| Catal Lett 135 (2010) 26-32 | Na/Ce/MgO | 973 | 5.0 | 1.0 | | 4.5 | 80.0 | | | 20.0 | 0.9 |
| Catal Lett 135 (2010) 26-32 | Na/Ce/MgO | 1023 | 5.0 | 1.0 | | 8.0 | 57.0 | | | 43.0 | 3.4 |
| Catal Lett 135 (2010) 26-32 | Na/Ce/MgO | 1073 | 5.0 | 1.0 | | 16.0 | 52.0 | | | 48.0 | 7.7 |
| Ind Eng Chem Res 49 (2010) 2078-2083 | Na2WO4/Mn/SiO2 | 1073 | 2.5 | 1.0 | 100.0 | 31.2 | 43.1 | 17.3 | 15.0 | 32.3 | 10.1 |
| Ind Eng Chem Res 49 (2010) 2078-2083 | Na2WO4/Mn/SiO2 | 1073 | 2.5 | 1.0 | 100.0 | 30.7 | 43.8 | 43.4 | 14.7 | 58.1 | 17.8 |
| Inorg Chem 49 (2010) 10244-10246 | La2O3-SiO2 | 673 | 3.0 | 1.0 | | 5.4 | 63.8 | 18.3 | 17.9 | 36.2 | 2.0 |
| Inorg Chem 49 (2010) 10244-10246 | La2O3-SiO2 | 723 | 3.0 | 1.0 | | 27.8 | 57.3 | 20.9 | 21.8 | 42.7 | 11.9 |
| Inorg Chem 49 (2010) 10244-10246 | La2O3-SiO2 | 773 | 3.0 | 1.0 | | 29.6 | 54.6 | 22.4 | 23.0 | 45.4 | 13.4 |
| Inorg Chem 49 (2010) 10244-10246 | La2O3-SiO2 | 823 | 3.0 | 1.0 | | 21.4 | 53.5 | 23.2 | 23.3 | 46.5 | 10.0 |
| Inorg Chem 49 (2010) 10244-10246 | La2O3-SiO2 | 873 | 3.0 | 1.0 | | 33.4 | 49.6 | 25.6 | 24.8 | 50.4 | 16.8 |
| J Ind and Eng Chem 16 (2010) 923-928 | W-Na-Mn/SiO2 | 1048 | 2.0 | 1.0 | | 46.1 | 60.4 | 28.3 | 11.3 | 39.6 | 18.3 |
| J Ind and Eng Chem 16 (2010) 923-928 | Mo-Na-Mn/SiO2 | 1048 | 2.0 | 1.0 | | 33.6 | 62.8 | 23.9 | 13.3 | 37.2 | 12.5 |
| J Ind and Eng Chem 16 (2010) 923-928 | Nb-Na-Mn/SiO2 | 1048 | 2.0 | 1.0 | | 39.3 | 66.8 | 23.4 | 9.8 | 33.2 | 13.0 |
| J Ind and Eng Chem 16 (2010) 923-928 | V-Na-Mn/SiO2 | 1048 | 2.0 | 1.0 | | 33.5 | 92.0 | 4.5 | 3.5 | 8.0 | 2.7 |
| J Ind and Eng Chem 16 (2010) 923-928 | Cr-Na-Mn/SiO2 | 1048 | 2.0 | 1.0 | | 40.1 | 88.5 | 6.7 | 4.8 | 11.5 | 4.6 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1123 | 4.0 | 1.0 | | 25.9 | 48.0 | 30.3 | 21.7 | 52.0 | 13.5 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1123 | 4.0 | 1.0 | | 26.9 | 43.6 | 28.2 | 28.2 | 56.4 | 15.2 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1123 | 4.0 | 1.0 | | 26.9 | 47.5 | 31.5 | 21.0 | 52.5 | 14.1 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1123 | 8.0 | 1.0 | | 17.8 | 30.3 | 31.0 | 38.7 | 69.7 | 12.4 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1123 | 8.0 | 1.0 | | 19.7 | 31.5 | 28.2 | 40.3 | 68.5 | 13.5 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1123 | 8.0 | 1.0 | | 21.3 | 40.9 | 31.0 | 28.1 | 59.1 | 12.6 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1073 | 8.0 | 1.0 | | 18.6 | 27.9 | 29.7 | 42.4 | 72.1 | 13.4 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1073 | 8.0 | 1.0 | | 17.9 | 29.7 | 31.2 | 39.1 | 70.3 | 12.6 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--------------------------------|-------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|---------------------|---------------------|---------------------|
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1073 | 8.0 | 1.0 | | 16.7 | 41.2 | 24.2 | 34.6 | 58.8 | 9.8 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1023 | 4.0 | 1.0 | | 27.4 | 43.3 | 29.7 | 27.0 | 56.7 | 15.5 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1023 | 4.0 | 1.0 | | 25.7 | 44.4 | 24.7 | 30.9 | 55.6 | 14.3 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1023 | 4.0 | 1.0 | | 27.5 | 46.0 | 29.5 | 24.5 | 54.0 | 14.9 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1073 | 4.0 | 1.0 | | 22.5 | 46.6 | 23.7 | 29.7 | 53.4 | 12.0 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1073 | 4.0 | 1.0 | | 26.5 | 42.8 | 28.6 | 28.6 | 57.2 | 15.2 |
| J Nat Gas Chem 19 (2010) 25-30 | La2O3-CaO | 1073 | 8.0 | 1.0 | | 18.4 | 33.0 | 27.6 | 39.4 | 67.0 | 12.3 |
| J Nat Gas Chem 19 (2010) 35-42 | WO3/SiO2 | 1073 | 5.0 | 1.0 | | 12.0 | 41.0 | 26.2 | 32.8 | 59.0 | 7.1 |
| J Nat Gas Chem 19 (2010) 35-42 | WO3/SiO2 | 1073 | 5.0 | 1.0 | | 11.0 | 46.0 | 24.0 | 30.0 | 54.0 | 5.9 |
| J Nat Gas Chem 19 (2010) 35-42 | Mn2O3/SiO2 | 1073 | 5.0 | 1.0 | | 17.0 | 46.0 | 27.0 | 27.0 | 54.0 | 9.2 |
| J Nat Gas Chem 19 (2010) 35-42 | Mn2O3/SiO2 | 1073 | 5.0 | 1.0 | | 19.0 | 57.0 | 23.5 | 19.5 | 43.0 | 8.2 |
| J Nat Gas Chem 19 (2010) 35-42 | CeO2/SiO2 | 1073 | 5.0 | 1.0 | | 22.0 | 43.0 | 38.6 | 18.4 | 57.0 | 12.5 |
| J Nat Gas Chem 19 (2010) 35-42 | CeO2/SiO2 | 1073 | 5.0 | 1.0 | | 21.0 | 46.0 | 38.1 | 15.9 | 54.0 | 11.3 |
| J Nat Gas Chem 19 (2010) 35-42 | Mn-W/SiO2 | 1073 | 5.0 | 1.0 | | 25.0 | 52.0 | 29.5 | 18.5 | 48.0 | 12.0 |
| J Nat Gas Chem 19 (2010) 35-42 | Mn-W/SiO2 | 1073 | 5.0 | 1.0 | | 24.0 | 52.0 | 32.0 | 16.0 | 48.0 | 11.5 |
| J Nat Gas Chem 19 (2010) 35-42 | Ce-W/SiO2 | 1073 | 5.0 | 1.0 | | 23.0 | 57.0 | 21.5 | 21.5 | 43.0 | 9.9 |
| J Nat Gas Chem 19 (2010) 35-42 | Ce-W/SiO2 | 1073 | 5.0 | 1.0 | | 20.0 | 65.0 | 18.3 | 16.7 | 35.0 | 7.0 |
| J Nat Gas Chem 19 (2010) 35-42 | Na-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 26.0 | 34.0 | 45.4 | 20.6 | 66.0 | 17.2 |
| J Nat Gas Chem 19 (2010) 35-42 | Na-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 31.0 | 56.0 | 31.8 | 12.2 | 44.0 | 13.6 |
| J Nat Gas Chem 19 (2010) 35-42 | Na-Ce/SiO2 | 1073 | 5.0 | 1.0 | | 19.0 | 34.0 | 33.0 | 33.0 | 66.0 | 12.5 |
| J Nat Gas Chem 19 (2010) 35-42 | Na-Ce/SiO2 | 1073 | 5.0 | 1.0 | | 23.0 | 46.0 | 34.7 | 19.3 | 54.0 | 12.4 |
| J Nat Gas Chem 19 (2010) 35-42 | Na2WO4/SiO2 | 1073 | 5.0 | 1.0 | | 21.0 | 22.0 | 44.1 | 33.9 | 78.0 | 16.4 |
| J Nat Gas Chem 19 (2010) 35-42 | Na2WO4/SiO2 | 1073 | 5.0 | 1.0 | | 20.0 | 26.0 | 47.7 | 26.3 | 74.0 | 14.8 |
| J Nat Gas Chem 19 (2010) 35-42 | Na2WO4/Mn/SiO2 | 1073 | 5.0 | 1.0 | | 33.0 | 29.0 | 51.3 | 19.7 | 71.0 | 23.4 |
| J Nat Gas Chem 19 (2010) 35-42 | Na2WO4/Mn/SiO2 | 1073 | 5.0 | 1.0 | | 30.0 | 33.0 | 49.4 | 17.6 | 67.0 | 20.1 |
| J Nat Gas Chem 19 (2010) 35-42 | Na2WO4/Ce/SiO2 | 1073 | 5.0 | 1.0 | | 31.0 | 29.0 | 50.1 | 20.9 | 71.0 | 22.0 |
| J Nat Gas Chem 19 (2010) 35-42 | Na2WO4/Ce/SiO2 | 1073 | 5.0 | 1.0 | | 27.0 | 26.0 | 51.6 | 22.4 | 74.0 | 20.0 |
| J Nat Gas Chem 19 (2010) 47-53 | Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 88.0 | 26.6 | 48.1 | 35.6 | 16.3 | 51.9 | 13.8 |
| J Nat Gas Chem 19 (2010) 47-53 | Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 96.2 | 22.3 | 34.2 | 46.5 | 19.3 | 65.8 | 14.7 |
| J Nat Gas Chem 19 (2010) 47-53 | Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 96.4 | 20.0 | 36.9 | 44.1 | 19.0 | 63.1 | 12.6 |
| J Nat Gas Chem 19 (2010) 47-53 | Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 98.4 | 19.4 | 38.7 | 43.0 | 18.3 | 61.3 | 11.9 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 95.0 | 30.3 | 44.9 | 36.1 | 19.0 | 55.1 | 16.7 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 97.6 | 22.6 | 32.1 | 47.2 | 20.7 | 67.9 | 15.3 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 97.4 | 20.6 | 36.0 | 43.5 | 20.5 | 64.0 | 13.2 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 99.3 | 20.3 | 37.7 | 43.6 | 18.7 | 62.3 | 12.6 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 96.1 | 32.1 | 41.6 | 37.4 | 21.0 | 58.4 | 18.7 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 97.7 | 23.9 | 30.0 | 48.3 | 21.7 | 70.0 | 16.7 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 98.8 | 20.9 | 35.0 | 44.5 | 20.5 | 65.0 | 13.6 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 99.4 | 21.8 | 35.9 | 45.2 | 18.9 | 64.1 | 14.0 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 98.8 | 33.8 | 39.4 | 38.6 | 22.0 | 60.6 | 20.5 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 98.9 | 25.1 | 27.2 | 48.9 | 23.9 | 72.8 | 18.3 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 99.7 | 21.6 | 33.2 | 45.4 | 21.4 | 66.8 | 14.4 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 99.3 | 22.5 | 34.4 | 45.0 | 20.6 | 65.6 | 14.8 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------------|---------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 98.2 | 33.9 | 37.6 | 40.6 | 21.8 | 62.4 | 21.2 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 99.0 | 26.2 | 24.8 | 49.9 | 25.3 | 75.2 | 19.7 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 99.6 | 22.2 | 29.8 | 48.4 | 21.8 | 70.2 | 15.6 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 99.1 | 22.0 | 31.8 | 46.3 | 21.9 | 68.2 | 15.0 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 98.4 | 34.1 | 41.0 | 37.3 | 21.7 | 59.0 | 20.1 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 99.5 | 26.0 | 24.7 | 49.4 | 25.9 | 75.3 | 19.6 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 99.9 | 22.6 | 31.7 | 46.7 | 21.6 | 68.3 | 15.4 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 99.5 | 22.1 | 34.0 | 45.1 | 20.9 | 66.0 | 14.6 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 3.0 | 1.0 | 98.8 | 34.6 | 42.8 | 36.1 | 21.1 | 57.2 | 19.8 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 4.0 | 1.0 | 99.8 | 25.3 | 27.4 | 47.2 | 25.4 | 72.6 | 18.4 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 5.0 | 1.0 | 99.7 | 21.2 | 35.0 | 44.4 | 20.6 | 65.0 | 13.8 |
| J Nat Gas Chem 19 (2010) 47-53 | Ce/Na2WO4/Mn/SiO2 | 1113 | 6.0 | 1.0 | 98.9 | 21.7 | 36.0 | 44.2 | 19.8 | 64.0 | 13.9 |
| J Nat Gas Chem 19 (2010) 173-178 | La/MgO | 1073 | 4.0 | 1.0 | | 21.1 | 65.6 | | | 34.4 | 7.3 |
| J Nat Gas Chem 19 (2010) 173-178 | La/MgO | 1073 | 4.0 | 1.0 | | 25.3 | 48.9 | | | 51.1 | 12.9 |
| J Nat Gas Chem 19 (2010) 173-178 | La2O3 | 1073 | 4.0 | 1.0 | | 24.0 | 53.9 | | | 46.1 | 11.1 |
| J Nat Gas Chem 19 (2010) 173-178 | MgO | 1073 | 4.0 | 1.0 | | 22.9 | 61.5 | | | 37.5 | 8.6 |
| J Nat Gas Chem 19 (2010) 515-521 | Na-W-Mn-Zr-S-P/SiO2 | 1023 | 3.0 | 1.0 | | 31.3 | 48.6 | | | 51.4 | 16.1 |
| J Nat Gas Chem 19 (2010) 515-521 | Na-W-Mn-Zr-S-P-SiO2 | 1023 | 3.0 | 1.0 | | 13.4 | 53.0 | | | 47.0 | 6.3 |
| J Nat Gas Chem 19 (2010) 515-521 | Na-W-Mn-Zr-S-P/SiO2 | 1023 | 3.0 | 1.0 | | 46.6 | 48.9 | | | 51.1 | 23.8 |
| J Nat Gas Chem 19 (2010) 534-538 | La2O3-BaCO3 | 1073 | 4.0 | 1.0 | | 23.8 | 42.4 | 34.6 | 23.1 | 57.7 | 13.7 |
| J Nat Gas Chem 19 (2010) 534-538 | Sm2O3-BaCO3 | 1073 | 4.0 | 1.0 | | 24.1 | 42.4 | 35.3 | 22.4 | 57.7 | 13.9 |
| J Nat Gas Chem 19 (2010) 534-538 | MgO-BaCO3 | 1073 | 4.0 | 1.0 | | 23.2 | 47.0 | 33.9 | 19.0 | 52.9 | 12.3 |
| J Nat Gas Chem 19 (2010) 534-538 | CaO-BaCO3 | 1073 | 4.0 | 1.0 | | 23.9 | 48.0 | 29.3 | 22.5 | 51.8 | 12.4 |
| Patent 24.11.2010: CN 101385982 B | MgO-TiO2 | 1073 | 3.0 | 1.0 | | 29.3 | 41.5 | 36.5 | 21.9 | 58.5 | 17.1 |
| Patent 24.11.2010: CN 101385982 B | MgO-TiO2 | 1073 | 3.0 | 1.0 | | 28.8 | 41.3 | 37.2 | 21.5 | 58.7 | 16.9 |
| Patent 24.11.2010: CN 101385982 B | MgO-TiO2 | 1073 | 3.0 | 1.0 | | 30.2 | 39.6 | 38.3 | 22.2 | 60.4 | 18.2 |
| Patent 24.11.2010: CN 101385982 B | MgO-TiO2 | 1073 | 3.0 | 1.0 | | 29.9 | 40.8 | 36.6 | 22.6 | 59.2 | 17.7 |
| Patent 24.11.2010: CN 101385982 B | MgO-TiO2 | 1073 | 3.0 | 1.0 | | 29.7 | 39.0 | 37.9 | 23.2 | 61.0 | 18.1 |
| Patent 24.11.2010: CN 101385982 B | MgO-TiO2 | 1073 | 3.0 | 1.0 | | 28.6 | 41.7 | 36.9 | 21.4 | 58.3 | 16.6 |
| Patent 03.11.2010: GB2469877 A | BaTiO3 | 1048 | 2.0 | 1.0 | | 20.5 | 60.0 | | | 40.1 | 8.2 |
| Patent 03.11.2010: GB2469877 A | BaTiGeO3 | 1048 | 2.0 | 1.0 | | 33.4 | 53.5 | | | 46.5 | 15.5 |
| Patent 03.11.2010: GB2469877 A | BaTiSnO3 | 1048 | 2.0 | 1.0 | | 25.9 | 46.5 | | | 53.6 | 13.8 |
| Patent 03.11.2010: GB2469877 A | BaTiAlO3 | 1048 | 2.0 | 1.0 | | 37.0 | 50.0 | | | 50.0 | 18.5 |
| Patent 03.11.2010: GB2469877 A | BaTiGaO3 | 1048 | 2.0 | 1.0 | | 47.0 | 50.0 | | | 50.0 | 23.5 |
| Patent 03.11.2010: GB2469877 A | BaTiGdO3 | 1048 | 2.0 | 1.0 | | 26.4 | 37.5 | | | 62.5 | 16.5 |
| Patent 03.11.2010: GB2469877 A | BaTiGaO3 | 1048 | 2.0 | 1.0 | | 43.9 | 44.5 | | | 55.5 | 24.4 |
| Patent 03.11.2010: GB2469877 A | CaZrLiO3 | 1048 | 2.0 | 1.0 | | 44.2 | 40.9 | | | 59.1 | 26.1 |
| Patent: 30.12.2010: US2010/0331595 A1 | Ba/MgO | 873 | 5.0 | 1.0 | | 0.3 | 45.7 | 0.0 | 54.3 | 54.3 | 0.2 |
| Patent: 30.12.2010: US2010/0331595 A1 | Ba/MgO | 923 | 5.0 | 1.0 | | 14.3 | 31.8 | 31.4 | 31.6 | 68.2 | 9.8 |
| Patent: 30.12.2010: US2010/0331595 A1 | Sr-La/MgO | 773 | 5.0 | 1.0 | | 19.4 | 96.2 | 0.0 | 3.8 | 3.8 | 0.7 |
| Patent: 30.12.2010: US2010/0331595 A1 | Sr-La/MgO | 823 | 5.0 | 1.0 | | 23.1 | 96.8 | 0.0 | 3.2 | 3.2 | 0.7 |
| Patent: 30.12.2010: US2010/0331595 A1 | Sr-La/MgO | 873 | 5.0 | 1.0 | | 34.9 | 70.1 | 14.8 | 14.2 | 29.9 | 10.4 |
| Patent: 30.12.2010: US2010/0331595 A1 | Sr-La/MgO | 923 | 5.0 | 1.0 | | 36.1 | 66.6 | 16.6 | 16.1 | 33.4 | 12.1 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | p(CH ₄)/p(O ₂) | p _{total} , bar | X(O ₂), % | X(CH ₄), % | S(CO _x), % | S(C ₂ ⁻), % | S(C ₂ -), % | S(C ₂), % | Y(C ₂), % |
|---------------------------------------|--------------|----------|--|--------------------------|-----------------------|------------------------|------------------------|------------------------------------|------------------------|-----------------------|-----------------------|
| Patent: 30.12.2010: US2010/0331595 A1 | Sr-La/MgO | 973 | 5.0 | 1.0 | | 35.8 | 66.2 | 17.5 | 15.6 | 33.8 | 12.1 |
| Patent: 30.12.2010: US2010/0331595 A1 | Na-Cs-Re/MgO | 873 | 5.0 | 1.0 | | 0.2 | 100.0 | | | 0.0 | 0.0 |
| Patent: 30.12.2010: US2010/0331595 A1 | Na-Cs-Re/MgO | 923 | 5.0 | 1.0 | | 0.4 | 100.0 | | | 0.0 | 0.0 |
| Patent: 30.12.2010: US2010/0331595 A1 | Na-Cs-Re/MgO | 973 | 5.0 | 1.0 | | 1.0 | 100.0 | | | 0.0 | 0.0 |
| Patent: 30.12.2010: US2010/0331595 A1 | Na-Cs-Re/MgO | 1023 | 5.0 | 1.0 | | 4.8 | 95.2 | 1.0 | 3.8 | 4.8 | 0.2 |
| Appl Catal A 391 (2011) 205-214 | Th2O3 | 1003 | 5.0 | 1.0 | 80.0 | 16.0 | | | | 31.0 | 5.0 |
| Appl Catal A 391 (2011) 205-214 | Na-Th2O3 | 1003 | 5.0 | 1.0 | 98.0 | 22.0 | | | | 47.0 | 10.3 |
| Appl Catal A 391 (2011) 205-214 | Ca-Th2O3 | 1003 | 5.0 | 1.0 | 100.0 | 24.0 | | | | 56.0 | 13.4 |
| Appl Catal A 391 (2011) 205-214 | Na-Ca-Th2O3 | 1003 | 5.0 | 1.0 | 100.0 | 23.0 | | | | 58.0 | 13.3 |
| Appl Catal A 391 (2011) 205-214 | K-Ca-Th2O3 | 1003 | 5.0 | 1.0 | 100.0 | 24.0 | | | | 56.0 | 13.4 |
| Appl Catal A 391 (2011) 205-214 | SrLaO3 | 1003 | 5.0 | 1.0 | 100.0 | 25.0 | | | | 63.0 | 15.8 |
| Appl Catal A 391 (2011) 205-214 | Li/MgO | 1003 | 5.0 | 1.0 | 9.0 | 1.0 | | | | 40.0 | 0.4 |
| Appl Catal A 391 (2011) 205-214 | Na-W-Mn/SiO2 | 1003 | 5.0 | 1.0 | 7.0 | 1.0 | | | | 49.0 | 0.5 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1015 | 2.1 | 1.0 | 3.0 | 1.0 | 20.0 | 16.0 | 64.0 | 80.0 | 0.8 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1055 | 2.3 | 1.0 | 20.0 | 5.0 | 17.0 | 21.0 | 61.0 | 83.0 | 4.2 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1074 | 2.0 | 1.0 | 17.0 | 11.0 | 18.0 | 30.0 | 50.0 | 82.0 | 9.0 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1127 | 2.1 | 1.0 | 92.0 | 45.0 | 47.0 | 36.0 | 12.0 | 53.0 | 23.9 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1158 | 2.2 | 1.0 | 94.0 | 46.0 | 49.0 | 36.0 | 10.0 | 51.0 | 23.5 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1170 | 2.1 | 1.0 | 97.0 | 45.0 | 54.0 | 33.0 | 9.0 | 46.0 | 20.7 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1205 | 2.3 | 1.0 | 98.0 | 44.0 | 55.0 | 32.0 | 8.0 | 45.0 | 19.8 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1103 | 3.2 | 1.0 | 23.0 | 15.0 | 15.0 | 36.0 | 39.0 | 85.0 | 12.8 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1170 | 3.2 | 1.0 | 94.0 | 34.0 | 39.0 | 42.0 | 14.0 | 61.0 | 20.7 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1199 | 3.2 | 1.0 | 96.0 | 33.0 | 40.0 | 41.0 | 13.0 | 60.0 | 19.8 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1217 | 3.2 | 1.0 | 98.0 | 33.0 | 43.0 | 40.0 | 12.0 | 57.0 | 18.8 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1155 | 4.0 | 1.0 | 89.0 | 30.0 | 31.0 | 46.0 | 17.0 | 69.0 | 20.7 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1188 | 4.0 | 1.0 | 95.0 | 27.0 | 35.0 | 44.0 | 14.0 | 65.0 | 17.6 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1203 | 4.0 | 1.0 | 96.0 | 27.0 | 37.0 | 44.0 | 13.0 | 63.0 | 17.0 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1211 | 4.0 | 1.0 | 96.0 | 27.0 | 38.0 | 43.0 | 12.0 | 62.0 | 16.7 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1176 | 2.1 | 1.0 | 84.0 | 31.0 | 37.0 | 46.0 | 8.0 | 63.0 | 19.5 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1016 | 2.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1085 | 2.3 | 1.0 | 16.0 | 3.0 | 2.0 | 36.0 | 57.0 | 98.0 | 2.9 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1145 | 2.3 | 1.0 | 6.0 | 10.0 | 14.0 | 56.0 | 22.0 | 86.0 | 8.6 |
| Appl Catal A 406 (2011) 1-12 | Li-W-Mn/SiO2 | 1173 | 2.3 | 1.0 | 40.0 | 18.0 | 35.0 | 48.0 | 10.0 | 65.0 | 11.7 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1092 | 2.1 | 1.0 | 89.0 | 37.0 | 52.0 | 35.0 | 11.0 | 48.0 | 17.8 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1124 | 2.2 | 1.0 | 96.0 | 40.0 | 55.0 | 28.0 | 7.0 | 45.0 | 18.0 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1175 | 2.0 | 1.0 | 97.0 | 45.0 | 47.0 | 36.0 | 14.0 | 53.0 | 23.9 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1123 | 2.7 | 1.0 | 95.0 | 34.0 | 50.0 | 36.0 | 11.0 | 50.0 | 17.0 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1151 | 2.7 | 1.0 | 96.0 | 39.0 | 50.0 | 34.0 | 6.0 | 50.0 | 19.5 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1172 | 3.0 | 1.0 | 96.0 | 44.0 | 48.0 | 36.0 | 13.0 | 52.0 | 22.9 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1182 | 3.0 | 1.0 | 97.0 | 44.0 | 46.0 | 38.0 | 11.0 | 54.0 | 23.8 |
| Appl Catal A 406 (2011) 1-12 | Na-W-Mn/SiO2 | 1181 | 2.7 | 1.0 | 98.0 | 38.0 | 53.0 | 30.0 | 6.0 | 47.0 | 17.9 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1090 | 2.0 | 1.0 | 13.0 | 16.0 | 35.0 | 32.0 | 35.0 | 65.0 | 10.4 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1122 | 2.1 | 1.0 | 70.0 | 35.0 | 41.0 | 37.0 | 17.0 | 59.0 | 20.7 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------------|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1157 | 2.1 | 1.0 | 75.0 | 37.0 | 46.0 | 38.0 | 11.0 | 54.0 | 20.0 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1142 | 2.2 | 1.0 | 47.0 | 21.0 | 30.0 | 40.0 | 25.0 | 70.0 | 14.7 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1147 | 2.2 | 1.0 | 66.0 | 31.0 | 33.0 | 43.0 | 22.0 | 67.0 | 20.8 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1154 | 2.2 | 1.0 | 64.0 | 28.0 | 31.0 | 42.0 | 20.0 | 69.0 | 19.3 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1057 | 2.4 | 1.0 | 3.0 | 6.0 | 28.0 | 21.0 | 46.0 | 72.0 | 4.3 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1077 | 2.5 | 1.0 | 16.0 | 16.0 | 22.0 | 34.0 | 42.0 | 78.0 | 12.5 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1155 | 2.4 | 1.0 | 88.0 | 41.0 | 34.0 | 40.0 | 22.0 | 66.0 | 27.1 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1168 | 2.4 | 1.0 | 90.0 | 39.0 | 38.0 | 42.0 | 16.0 | 62.0 | 24.2 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1170 | 2.5 | 1.0 | 90.0 | 39.0 | 40.0 | 41.0 | 16.0 | 60.0 | 23.4 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1089 | 4.6 | 1.0 | 33.0 | 8.0 | 12.0 | 37.0 | 47.0 | 88.0 | 7.0 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1119 | 4.6 | 1.0 | 61.0 | 20.0 | 12.0 | 46.0 | 35.0 | 88.0 | 17.6 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1149 | 4.6 | 1.0 | 79.0 | 26.0 | 16.0 | 50.0 | 28.0 | 84.0 | 21.8 |
| Appl Catal A 406 (2011) 1-12 | K-W-Mn/SiO2 | 1153 | 2.4 | 1.0 | 48.0 | 26.0 | 51.0 | 37.0 | 7.0 | 49.0 | 12.7 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1080 | 2.2 | 1.0 | 31.0 | 21.0 | 49.0 | 23.0 | 28.0 | 51.0 | 10.7 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1128 | 2.2 | 1.0 | 59.0 | 35.0 | 46.0 | 34.0 | 18.0 | 54.0 | 18.9 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1138 | 2.2 | 1.0 | 59.0 | 32.0 | 40.0 | 46.0 | 14.0 | 60.0 | 19.2 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1145 | 2.2 | 1.0 | 63.0 | 33.0 | 46.0 | 34.0 | 18.0 | 54.0 | 17.8 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1110 | 2.4 | 1.0 | 62.0 | 23.0 | 38.0 | 36.0 | 20.0 | 62.0 | 14.3 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1117 | 2.5 | 1.0 | 81.0 | 42.0 | 39.0 | 38.0 | 19.0 | 61.0 | 25.6 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1181 | 2.5 | 1.0 | 98.0 | 49.0 | 57.0 | 33.0 | 10.0 | 43.0 | 21.1 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1113 | 2.4 | 1.0 | 62.0 | 23.0 | 38.0 | 36.0 | 20.0 | 62.0 | 14.3 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1080 | 2.7 | 1.0 | 8.0 | 8.0 | 18.0 | 36.0 | 41.0 | 82.0 | 6.6 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1138 | 2.7 | 1.0 | 84.0 | 35.0 | 38.0 | 42.0 | 15.0 | 62.0 | 21.7 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1146 | 2.7 | 1.0 | 71.0 | 33.0 | 37.0 | 43.0 | 16.0 | 63.0 | 20.8 |
| Appl Catal A 406 (2011) 1-12 | Rb-W-Mn/SiO2 | 1168 | 2.7 | 1.0 | 52.0 | 26.0 | 35.0 | 40.0 | 19.0 | 65.0 | 16.9 |
| Appl Catal A 406 (2011) 1-12 | Cs-W-Mn/SiO2 | 1085 | 2.0 | 1.0 | 44.0 | 17.0 | 57.0 | 16.0 | 25.0 | 43.0 | 7.3 |
| Appl Catal A 406 (2011) 1-12 | Cs-W-Mn/SiO2 | 1164 | 2.0 | 1.0 | 91.0 | 37.0 | 47.0 | 33.0 | 17.0 | 53.0 | 19.6 |
| Appl Catal A 406 (2011) 1-12 | Cs-W-Mn/SiO2 | 1166 | 2.0 | 1.0 | 97.0 | 40.0 | 48.0 | 33.0 | 14.0 | 52.0 | 20.8 |
| Appl Catal A 406 (2011) 1-12 | Cs-W-Mn/SiO2 | 1122 | 2.7 | 1.0 | 96.0 | 37.0 | 54.0 | 32.0 | 8.0 | 46.0 | 17.0 |
| Appl Catal A 406 (2011) 1-12 | Cs-W-Mn/SiO2 | 1145 | 2.7 | 1.0 | 98.0 | 38.0 | 56.0 | 31.0 | 7.0 | 44.0 | 16.7 |
| Appl Catal A 406 (2011) 1-12 | Cs-W-Mn/SiO2 | 1177 | 2.7 | 1.0 | 98.0 | 38.0 | 57.0 | 31.0 | 4.0 | 43.0 | 16.3 |
| Appl Catal A 406 (2011) 1-12 | W-Mn/SiO2 | 1122 | 2.1 | 1.0 | 18.0 | 13.0 | 42.0 | 27.0 | 30.0 | 58.0 | 7.5 |
| Appl Catal A 406 (2011) 1-12 | W-Mn/SiO2 | 1157 | 2.1 | 1.0 | 32.0 | 22.0 | 45.0 | 33.0 | 19.0 | 55.0 | 12.1 |
| Appl Catal A 406 (2011) 1-12 | W-Mn/SiO2 | 1187 | 2.1 | 1.0 | 50.0 | 29.0 | 51.0 | 33.0 | 13.0 | 49.0 | 14.2 |
| Chem Eng Journal 168 (2011) 1352-1359 | Na-W-Mn/SiO2 | 1023 | 4.0 | 1.0 | 27.0 | 8.0 | 24.0 | | | 76.0 | 6.1 |
| Chem Eng Journal 168 (2011) 1352-1359 | SiO2 | 1073 | 4.0 | 1.0 | 22.0 | 4.0 | 82.0 | | | 18.0 | 0.7 |
| Fuel Proc Techn 92 (2011) 1164-1168 | Ba-Ti-Sn | 1048 | 2.0 | 1.0 | 68.0 | 31.2 | 55.7 | 34.7 | 6.4 | 41.1 | 12.8 |
| Fuel Proc Techn 92 (2011) 1164-1168 | Ba-Ti-Sn | 1048 | 2.0 | 1.0 | 67.1 | 28.5 | 63.3 | 32.0 | 7.0 | 39.0 | 11.1 |
| Fuel Proc Techn 92 (2011) 1164-1168 | Ba-Ti-Sn | 1048 | 2.0 | 1.0 | 99.5 | 44.2 | 50.7 | 40.0 | 3.2 | 43.2 | 19.1 |
| Fuel Proc Techn 92 (2011) 1164-1168 | Ba-Ti-Ce | 1048 | 2.0 | 1.0 | 83.9 | 37.1 | 60.3 | 33.1 | 4.3 | 37.4 | 13.9 |
| Fuel Proc Techn 92 (2011) 1164-1168 | Ba-Ti-Ce | 1048 | 2.0 | 1.0 | 83.8 | 36.7 | 64.1 | 31.3 | 4.6 | 35.9 | 13.2 |
| Fuel Proc Techn 92 (2011) 1164-1168 | Ba-Ti-Ce | 1048 | 2.0 | 1.0 | 98.2 | 47.5 | 48.5 | 39.9 | 3.1 | 43.0 | 20.4 |
| Fuel Proc Techn 92 (2011) 541-546 | Na2WO4/Mn/SiO2 | 1073 | 3.0 | 1.0 | | 27.8 | 35.0 | 42.1 | 22.9 | 65.0 | 18.1 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | p(CH ₄)/p(O ₂) | p _{total} , bar | X(O ₂), % | X(CH ₄), % | S(CO _x), % | S(C ₂ ⁻), % | S(C ₂ -), % | S(C ₂), % | Y(C ₂), % |
|-----------------------------------|--|----------|--|--------------------------|-----------------------|------------------------|------------------------|------------------------------------|------------------------|-----------------------|-----------------------|
| Fuel Proc Techn 92 (2011) 541-546 | Na ₂ WO ₄ /Mn/SiO ₂ | 1073 | 3.0 | 1.0 | | 33.8 | 40.7 | 40.7 | 18.6 | 59.3 | 20.0 |
| J Catal 281 (2011) 241-253 | Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 14.0 | 84.0 | 9.0 | 7.0 | 16.0 | 2.2 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 20.0 | 63.0 | 23.3 | 13.7 | 37.0 | 7.4 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 21.0 | 54.0 | 30.1 | 15.9 | 46.0 | 9.7 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 23.0 | 43.0 | 38.0 | 19.0 | 57.0 | 13.1 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 26.0 | 39.0 | 40.0 | 21.0 | 61.0 | 15.9 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 26.0 | 39.0 | 39.2 | 21.8 | 61.0 | 15.9 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 27.0 | 37.0 | 39.7 | 23.3 | 63.0 | 17.0 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 28.0 | 37.0 | 39.7 | 23.3 | 63.0 | 17.6 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 6.0 | 36.0 | 24.0 | 40.0 | 64.0 | 3.8 |
| J Catal 281 (2011) 241-253 | SrCO ₃ | 1083 | 4.9 | 1.0 | | 6.0 | 39.0 | 25.1 | 35.9 | 61.0 | 3.7 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 9.0 | 46.0 | 29.5 | 24.5 | 54.0 | 4.9 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 27.0 | 41.0 | 40.0 | 19.0 | 59.0 | 15.9 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 27.0 | 46.0 | 40.2 | 13.8 | 54.0 | 14.6 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 22.0 | 49.0 | | | 51.0 | 11.2 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 10.0 | 46.0 | 25.6 | 28.4 | 54.0 | 5.4 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 18.0 | 42.0 | 34.8 | 23.2 | 58.0 | 10.4 |
| J Catal 281 (2011) 241-253 | Sr/Al ₂ O ₃ | 1083 | 4.9 | 1.0 | | 29.0 | 38.0 | 39.0 | 23.0 | 62.0 | 18.0 |
| J Catal 281 (2011) 241-253 | Na ₂ WO ₄ /Mn/SiO ₂ | 1083 | 4.9 | 1.0 | | 18.0 | 32.0 | 44.6 | 23.4 | 68.0 | 12.2 |
| J Catal 281 (2011) 241-253 | Sr/La ₂ O ₃ | 1083 | 4.9 | 1.0 | | 25.0 | 37.0 | 18.0 | 45.0 | 63.0 | 15.8 |
| J Mol Catal A 346 (2011) 46-54 | ZnO-Sm ₂ O ₃ | 1048 | 5.0 | 1.0 | | 21.7 | 58.1 | | | 41.9 | 9.1 |
| J Mol Catal A 346 (2011) 46-54 | MgO-Sm ₂ O ₃ | 1048 | 5.0 | 1.0 | | 23.2 | 50.8 | | | 49.2 | 11.4 |
| J Mol Catal A 346 (2011) 46-54 | CaO-Sm ₂ O ₃ | 1048 | 5.0 | 1.0 | | 25.0 | 42.8 | | | 57.2 | 14.3 |
| J Mol Catal A 346 (2011) 46-54 | SrO-Sm ₂ O ₃ | 1048 | 5.0 | 1.0 | | 25.9 | 40.2 | | | 59.8 | 15.5 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 873 | 6.0 | 1.0 | 2.4 | 0.2 | 100.0 | | | 0.0 | 0.0 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 923 | 6.0 | 1.0 | 6.3 | 0.6 | 100.0 | | | 0.0 | 0.0 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 948 | 6.0 | 1.0 | 21.0 | 3.4 | 44.3 | | | 55.7 | 1.9 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 973 | 6.0 | 1.0 | 97.7 | 22.1 | 24.6 | | | 75.4 | 16.7 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 873 | 6.0 | 1.0 | 2.8 | 0.1 | 100.0 | | | 0.0 | 0.0 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 923 | 6.0 | 1.0 | 10.6 | 1.1 | 89.1 | | | 10.9 | 0.1 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 948 | 6.0 | 1.0 | 24.6 | 3.9 | 47.8 | | | 52.2 | 2.0 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 973 | 6.0 | 1.0 | 93.4 | 20.2 | 28.4 | | | 71.7 | 14.5 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 983 | 6.0 | 1.0 | 96.9 | 2.2 | 27.0 | | | 73.0 | 1.6 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 988 | 6.0 | 1.0 | 97.8 | 22.1 | 25.5 | | | 74.5 | 16.5 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 873 | 6.0 | 1.0 | 3.2 | 0.3 | 100.0 | | | 0.0 | 0.0 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 923 | 6.0 | 1.0 | 10.8 | 1.0 | 100.0 | | | 0.0 | 0.0 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 948 | 6.0 | 1.0 | 21.2 | 3.4 | 47.5 | | | 52.5 | 1.8 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 973 | 6.0 | 1.0 | 40.0 | 7.6 | 36.3 | | | 63.7 | 4.8 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 983 | 6.0 | 1.0 | 95.5 | 21.1 | 27.2 | | | 72.8 | 15.4 |
| J Nat Gas Chem 20 (2011) 204-213 | Na ₂ WO ₄ /Mn/SiO ₂ | 998 | 6.0 | 1.0 | 98.0 | 22.0 | 22.0 | | | 74.0 | 16.3 |
| J Nat Gas Chem 20 (2011) 428-434 | Na ₂ SO ₄ -Mn/SiO ₂ | 1023 | 5.0 | 1.0 | | 7.0 | 40.9 | 25.4 | 33.7 | 59.1 | 4.1 |
| J Nat Gas Chem 20 (2011) 428-434 | Na ₂ SO ₄ -Mn/SiO ₂ | 1048 | 5.0 | 1.0 | | 8.0 | 33.0 | 35.4 | 31.6 | 67.0 | 5.4 |
| J Nat Gas Chem 20 (2011) 428-434 | Na ₂ SO ₄ -Mn/SiO ₂ | 1073 | 5.0 | 1.0 | | 11.0 | 28.7 | 40.9 | 30.4 | 71.3 | 7.8 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--|--------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1098 | 5.0 | 1.0 | | 14.0 | 27.4 | 48.1 | 24.5 | 72.6 | 10.2 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 12.0 | 31.0 | 41.4 | 27.6 | 69.0 | 8.3 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 13.0 | 38.3 | 41.6 | 20.1 | 61.7 | 8.0 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 13.0 | 42.0 | 41.6 | 16.4 | 58.0 | 7.5 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 2.5 | 1.0 | | 15.0 | 27.1 | 43.1 | 29.8 | 72.9 | 10.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 3.3 | 1.0 | | 13.0 | 27.8 | 42.1 | 30.1 | 72.2 | 9.4 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 7.5 | 1.0 | | 10.0 | 28.9 | 40.1 | 31.0 | 71.1 | 7.1 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-Mn/SiO2 | 1073 | 10.0 | 1.0 | | 9.0 | 28.1 | 39.8 | 32.1 | 71.9 | 6.5 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1023 | 5.0 | 1.0 | | 4.0 | 39.4 | 21.9 | 38.7 | 60.6 | 2.4 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1048 | 5.0 | 1.0 | | 5.0 | 34.0 | 29.7 | 36.3 | 66.0 | 3.3 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 5.0 | 1.0 | | 7.0 | 29.9 | 38.3 | 31.8 | 70.1 | 4.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1098 | 5.0 | 1.0 | | 10.0 | 29.4 | 41.1 | 29.5 | 70.6 | 7.1 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 5.0 | 1.0 | | 8.0 | 31.3 | 38.9 | 29.8 | 68.7 | 5.5 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 5.0 | 1.0 | | 8.0 | 32.5 | 39.1 | 28.4 | 67.5 | 5.4 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 5.0 | 1.0 | | 8.0 | 40.8 | 39.1 | 20.1 | 59.2 | 4.7 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 2.5 | 1.0 | | 11.0 | 23.1 | 46.1 | 30.8 | 76.9 | 8.5 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 3.3 | 1.0 | | 10.0 | 22.9 | 45.9 | 31.2 | 77.1 | 7.7 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 7.5 | 1.0 | | 5.0 | 30.0 | 38.2 | 31.8 | 70.0 | 3.5 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3/SiO2 | 1073 | 10.0 | 1.0 | | 4.0 | 27.2 | 37.9 | 34.9 | 72.8 | 2.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1023 | 5.0 | 1.0 | | 19.0 | 48.6 | 24.0 | 27.4 | 51.4 | 9.8 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1048 | 5.0 | 1.0 | | 30.0 | 44.9 | 33.7 | 21.4 | 55.1 | 16.5 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 30.0 | 40.2 | 38.7 | 21.1 | 59.8 | 17.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1098 | 5.0 | 1.0 | | 33.0 | 39.5 | 44.0 | 16.5 | 60.5 | 20.0 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 31.0 | 41.6 | 39.0 | 19.4 | 58.4 | 18.1 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 32.0 | 44.2 | 39.4 | 16.4 | 55.8 | 17.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 5.0 | 1.0 | | 32.0 | 44.1 | 39.6 | 16.3 | 55.9 | 17.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 2.5 | 1.0 | | 37.0 | 45.1 | 42.2 | 12.7 | 54.9 | 20.3 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 3.3 | 1.0 | | 33.0 | 42.7 | 41.1 | 16.2 | 57.3 | 18.9 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 7.5 | 1.0 | | 24.0 | 39.1 | 37.9 | 23.0 | 60.9 | 14.6 |
| J Nat Gas Chem 20 (2011) 428-434 | Na2SO4-WO3-Mn/SiO2 | 1073 | 10.0 | 1.0 | | 20.0 | 37.4 | 37.3 | 25.3 | 62.6 | 12.5 |
| J Taiwan Inst Chem Eng 42 (2011) 751-759 | Na2WO4/Mn/SiO2 | 987 | 3.5 | 1.0 | | 34.0 | 32.9 | | | 67.1 | 22.8 |
| J Taiwan Inst Chem Eng 42 (2011) 751-759 | Na2WO4/Mn/SiO2 | 948 | 3.3 | 1.0 | | 35.8 | 34.1 | | | 65.9 | 23.6 |
| Angew Chem Int Ed 52(2013) 11381 | Fe-MgO | 1023 | 3.0 | 1.0 | 20.0 | 5.7 | | | | 8.4 | 0.5 |
| Angew Chem Int Ed 52(2013) 11381 | Au-MgO | 1023 | 3.0 | 1.0 | 4.0 | 0.8 | | | | 6.9 | 0.1 |
| Angew Chem Int Ed 52(2013) 11381 | Fe-Au-MgO | 1023 | 3.0 | 1.0 | 35.0 | 9.2 | | | | 8.8 | 0.8 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (Cl)- OM | 1013 | 9.0 | 1.0 | | 7.5 | 56.0 | 17.4 | 26.6 | 44.0 | 3.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (Cl)- OM | 1013 | 7.0 | 1.0 | | 10.5 | 56.1 | 19.3 | 24.7 | 43.9 | 4.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (Cl)- OM | 1013 | 4.0 | 1.0 | | 17.5 | 56.8 | 22.7 | 20.6 | 43.5 | 7.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (Cl)- OM | 1073 | 9.0 | 1.0 | | 8.5 | 48.9 | 29.7 | 21.4 | 51.1 | 4.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (Cl)- OM | 1073 | 7.0 | 1.0 | | 12.5 | 52.9 | 29.8 | 17.3 | 47.1 | 5.9 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (Cl)- OM | 1073 | 4.0 | 1.0 | | 17.5 | 58.8 | 28.3 | 12.9 | 41.2 | 7.2 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- OM | 1013 | 9.0 | 1.0 | | 10.0 | 41.3 | 25.5 | 33.2 | 58.5 | 5.9 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- OM | 1013 | 7.0 | 1.0 | | 12.2 | 44.6 | 25.4 | 30.0 | 55.5 | 6.8 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|----------------------------------|---------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- OM | 1013 | 4.0 | 1.0 | | 19.5 | 56.4 | 22.9 | 20.7 | 43.5 | 8.5 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- OM | 1073 | 9.0 | 1.0 | | 10.0 | 43.0 | 36.0 | 21.0 | 57.0 | 5.7 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- OM | 1073 | 7.0 | 1.0 | | 12.0 | 46.4 | 34.7 | 18.9 | 53.5 | 6.4 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- OM | 1073 | 4.0 | 1.0 | | 19.0 | 60.1 | 27.6 | 12.3 | 40.0 | 7.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- ME | 1013 | 9.0 | 1.0 | | 10.5 | 41.8 | 23.0 | 27.6 | 50.5 | 5.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- ME | 1013 | 7.0 | 1.0 | | 13.0 | 39.4 | 23.9 | 28.7 | 52.5 | 6.8 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- ME | 1013 | 4.0 | 1.0 | | 17.5 | 60.3 | 15.3 | 14.5 | 30.0 | 5.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- ME | 1073 | 9.0 | 1.0 | | 8.5 | 49.5 | 21.5 | 16.0 | 37.5 | 3.2 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- ME | 1073 | 7.0 | 1.0 | | 13.0 | 42.4 | 29.4 | 18.3 | 47.5 | 6.2 |
| Appl Catal A 454(2013) 100-114 | Sm2O3 (N)- ME | 1073 | 4.0 | 1.0 | | 18.0 | 59.5 | 19.2 | 8.7 | 28.0 | 5.0 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-OM | 1013 | 9.0 | 1.0 | | 5.0 | 93.8 | 0.8 | 5.4 | 6.0 | 0.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-OM | 1013 | 7.0 | 1.0 | | 7.0 | 92.7 | 1.5 | 5.8 | 7.5 | 0.5 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-OM | 1013 | 4.0 | 1.0 | | 12.5 | 89.4 | 4.5 | 6.1 | 10.5 | 1.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-OM | 1073 | 9.0 | 1.0 | | 6.0 | 81.9 | 8.7 | 9.4 | 18.0 | 1.1 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-OM | 1073 | 7.0 | 1.0 | | 7.5 | 80.2 | 11.0 | 8.7 | 20.0 | 1.5 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-OM | 1073 | 4.0 | 1.0 | | 14.5 | 75.4 | 18.3 | 6.3 | 24.5 | 3.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1013 | 9.0 | 1.0 | | 6.0 | 78.3 | 5.8 | 15.9 | 22.0 | 1.3 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1013 | 7.0 | 1.0 | | 8.5 | 79.7 | 5.8 | 14.5 | 20.5 | 1.7 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1013 | 4.0 | 1.0 | | 14.0 | 79.0 | 9.2 | 11.8 | 21.0 | 2.9 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1073 | 9.0 | 1.0 | | 7.5 | 65.9 | 19.8 | 14.3 | 34.0 | 2.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1073 | 7.0 | 1.0 | | 9.0 | 70.0 | 16.4 | 13.5 | 30.0 | 2.7 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1073 | 4.0 | 1.0 | | 15.0 | 72.0 | 19.3 | 8.8 | 28.0 | 4.2 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1013 | 9.0 | 1.0 | | 7.0 | 80.5 | 7.1 | 12.4 | 19.5 | 1.4 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1013 | 7.0 | 1.0 | | 8.5 | 81.0 | 6.5 | 12.5 | 19.0 | 1.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1013 | 4.0 | 1.0 | | 15.5 | 75.5 | 13.7 | 10.8 | 24.5 | 3.8 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1073 | 9.0 | 1.0 | | 7.5 | 71.7 | 15.9 | 12.4 | 28.5 | 2.1 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1073 | 7.0 | 1.0 | | 9.5 | 71.3 | 17.8 | 10.9 | 28.5 | 2.7 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1073 | 4.0 | 1.0 | | 16.5 | 72.4 | 20.1 | 7.6 | 27.5 | 4.5 |
| Appl Catal A 454(2013) 100-114 | p-Al2O3 | 1013 | 4.0 | 1.0 | | 10.5 | 91.4 | 2.4 | 6.1 | 8.5 | 0.9 |
| Appl Catal A 454(2013) 100-114 | n-Al2O3(-) | 1013 | 4.0 | 1.0 | | 11.5 | 89.8 | 1.7 | 8.5 | 10.0 | 1.2 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(+)-OM | 1013 | 4.0 | 1.0 | | 12.0 | 85.2 | 7.8 | 7.0 | 15.0 | 1.8 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(+)-OM | 1073 | 4.0 | 1.0 | | 13.5 | 78.9 | 14.8 | 6.4 | 21.0 | 2.8 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(+)-IM | 1013 | 4.0 | 1.0 | | 14.0 | 76.4 | 13.2 | 10.4 | 17.5 | 2.5 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(+)-IM | 1073 | 4.0 | 1.0 | | 15.5 | 76.7 | 15.2 | 8.2 | 24.5 | 3.8 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(-)-OM | 1013 | 4.0 | 1.0 | | 14.5 | 82.7 | 8.4 | 9.0 | 23.5 | 3.4 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(-)-OM | 1073 | 4.0 | 1.0 | | 14.5 | 75.5 | 17.2 | 7.3 | 23.5 | 3.4 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(-)-IM | 1013 | 4.0 | 1.0 | | 16.0 | 67.9 | 17.4 | 14.7 | 32.0 | 5.1 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/n-Al2O3(-)-IM | 1073 | 4.0 | 1.0 | | 16.0 | 65.0 | 24.1 | 10.9 | 35.0 | 5.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1013 | 4.0 | 1.0 | | 16.0 | 69.0 | 17.0 | 14.0 | 31.0 | 5.0 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-ME | 1073 | 4.0 | 1.0 | | 16.0 | 69.5 | 21.5 | 9.0 | 30.5 | 4.9 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1013 | 4.0 | 1.0 | | 15.0 | 75.8 | 12.0 | 12.2 | 24.0 | 3.6 |
| Appl Catal A 454(2013) 100-114 | Sm2O3/p-Al2O3-IM | 1073 | 4.0 | 1.0 | | 15.5 | 72.5 | 19.8 | 7.7 | 27.5 | 4.3 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2 | 998 | 2.0 | 1.0 | | 1.4 | 71.4 | 2.6 | 26.0 | 28.6 | 0.4 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|----------------------------------|--------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|---------------------|---------------------|---------------------|
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 998 | 2.0 | 1.0 | | 2.8 | 76.5 | 3.9 | 19.6 | 23.5 | 0.6 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 998 | 2.0 | 1.0 | | 11.2 | 72.5 | 7.9 | 19.6 | 27.5 | 3.1 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 998 | 2.0 | 1.0 | | 1.4 | 68.9 | 2.8 | 28.3 | 31.1 | 0.4 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/MgO | 998 | 2.0 | 1.0 | | 3.8 | 88.8 | 1.9 | 9.3 | 11.2 | 0.4 |
| Appl Catal A 464-465(2013) 68-77 | TiO2-MgO | 998 | 2.0 | 1.0 | | 7.2 | 97.4 | 0.4 | 2.2 | 2.6 | 0.2 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2 | 1023 | 2.0 | 1.0 | | 2.1 | 52.6 | 4.3 | 43.1 | 47.4 | 1.0 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1023 | 2.0 | 1.0 | | 9.9 | 76.1 | 6.8 | 17.1 | 23.9 | 2.3 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1023 | 2.0 | 1.0 | | 25.7 | 58.1 | 21.0 | 21.0 | 41.9 | 10.8 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1023 | 2.0 | 1.0 | | 4.3 | 62.8 | 6.2 | 31.0 | 37.2 | 1.6 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/MgO | 1023 | 2.0 | 1.0 | | 4.9 | 65.1 | 8.1 | 26.8 | 34.9 | 1.7 |
| Appl Catal A 464-465(2013) 68-77 | TiO2-MgO | 1023 | 2.0 | 1.0 | | 12.7 | 96.3 | 0.9 | 2.8 | 3.7 | 0.5 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2 | 1048 | 2.0 | 1.0 | | 5.0 | 50.5 | 11.4 | 38.1 | 49.5 | 2.4 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1048 | 2.0 | 1.0 | | 22.6 | 62.5 | 17.8 | 19.7 | 37.5 | 8.5 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1048 | 2.0 | 1.0 | | 37.1 | 55.4 | 27.4 | 17.2 | 44.6 | 16.5 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1048 | 2.0 | 1.0 | | 9.2 | 49.4 | 16.9 | 33.7 | 50.6 | 4.6 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/MgO | 1048 | 2.0 | 1.0 | | 10.6 | 59.8 | 15.1 | 25.1 | 40.2 | 4.3 |
| Appl Catal A 464-465(2013) 68-77 | TiO2-MgO | 1048 | 2.0 | 1.0 | | 18.1 | 94.3 | 1.9 | 3.8 | 5.7 | 1.0 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2 | 1073 | 2.0 | 1.0 | | 11.8 | 48.9 | 19.2 | 31.9 | 51.1 | 6.0 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1073 | 2.0 | 1.0 | | 34.0 | 59.8 | 24.7 | 15.5 | 40.2 | 13.7 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1073 | 2.0 | 1.0 | | 41.4 | 56.9 | 28.7 | 14.4 | 43.1 | 17.9 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1073 | 2.0 | 1.0 | | 15.8 | 38.2 | 29.3 | 32.5 | 61.8 | 9.8 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/MgO | 1073 | 2.0 | 1.0 | | 11.9 | 46.9 | 23.6 | 29.5 | 53.1 | 6.3 |
| Appl Catal A 464-465(2013) 68-77 | TiO2-MgO | 1073 | 2.0 | 1.0 | | 21.7 | 91.9 | 3.6 | 4.5 | 8.1 | 1.8 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2 | 1098 | 2.0 | 1.0 | | 23.9 | 48.6 | 30.0 | 21.4 | 51.4 | 12.3 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1098 | 2.0 | 1.0 | | 37.5 | 59.4 | 27.1 | 13.5 | 40.6 | 15.2 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1098 | 2.0 | 1.0 | | 42.4 | 57.3 | 29.4 | 13.3 | 42.7 | 18.1 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1098 | 2.0 | 1.0 | | 40.9 | 56.0 | 31.4 | 12.6 | 44.0 | 18.0 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/MgO | 1098 | 2.0 | 1.0 | | 16.3 | 43.1 | 31.0 | 25.9 | 56.9 | 9.3 |
| Appl Catal A 464-465(2013) 68-77 | TiO2-MgO | 1098 | 2.0 | 1.0 | | 23.5 | 89.0 | 5.8 | 5.2 | 11.0 | 2.6 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2 | 1123 | 2.0 | 1.0 | | 37.3 | 54.4 | 32.9 | 12.7 | 45.6 | 17.0 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1123 | 2.0 | 1.0 | | 39.1 | 58.7 | 29.5 | 11.8 | 41.3 | 16.1 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1123 | 2.0 | 1.0 | | 42.4 | 58.3 | 29.8 | 11.9 | 41.7 | 17.7 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/TiO2-MgO | 1123 | 2.0 | 1.0 | | 42.0 | 59.0 | 30.5 | 10.5 | 41.0 | 17.2 |
| Appl Catal A 464-465(2013) 68-77 | Na2WO4/Mn/MgO | 1123 | 2.0 | 1.0 | | 29.8 | 49.2 | 36.3 | 14.5 | 50.8 | 15.1 |
| Appl Catal A 464-465(2013) 68-77 | TiO2-MgO | 1123 | 2.0 | 1.0 | | 25.0 | 85.6 | 8.6 | 5.8 | 14.4 | 3.6 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 873 | 4.0 | 1.0 | | 9.0 | 96.0 | | | 4.0 | 0.4 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 923 | 4.0 | 1.0 | | 14.6 | 82.0 | | | 18.0 | 2.6 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 973 | 4.0 | 1.0 | | 19.5 | 65.5 | | | 34.5 | 6.7 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 1023 | 4.0 | 1.0 | | 20.6 | 64.0 | | | 36.0 | 7.4 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 873 | 4.0 | 1.0 | | 15.8 | 86.0 | | | 14.0 | 2.2 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 923 | 4.0 | 1.0 | | 19.8 | 66.0 | | | 34.0 | 6.7 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 973 | 4.0 | 1.0 | | 22.0 | 59.0 | | | 41.0 | 9.0 |
| Catal Commu 42 (2013) 50-53 | La-Ce-O | 1023 | 4.0 | 1.0 | | 23.6 | 55.5 | | | 44.5 | 10.5 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| ChemCatChem 5 (2013) 697-700 | Na-W-Mn/SiO2 | 1103 | 2.0 | 1.0 | | 47.0 | 53.2 | | | 42.6 | 20.0 |
| ChemCatChem 5 (2013) 2809-2812 | Ce-LaO3 | 1083 | 7.0 | 1.0 | | 22.0 | 32.0 | | | 68.0 | 15.0 |
| ChemCatChem 5 (2013) 2809-2812 | Ce-LaO3 | 1063 | 9.0 | 1.0 | | 19.0 | 28.0 | | | 72.0 | 13.7 |
| ChemCatChem 5 (2013) 2809-2812 | Ce-LaO3 | 1113 | 11.0 | 1.0 | | 17.5 | 23.0 | | | 77.0 | 13.5 |
| ChemCatChem 5 (2013) 3725-3735 | MgO | 923 | 3.0 | 1.0 | | 3.2 | 100.0 | | | 0.0 | 0.0 |
| ChemCatChem 5 (2013) 3725-3735 | MgO | 923 | 3.0 | 1.0 | | 3.0 | 100.0 | | | 0.0 | 0.0 |
| ChemCatChem 5 (2013) 3725-3735 | La2O3 | 923 | 3.0 | 1.0 | | 28.1 | 55.8 | | | 44.2 | 12.4 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 25.4 | 62.2 | | | 37.8 | 9.6 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 29.5 | 59.5 | | | 40.5 | 11.9 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 28.1 | 55.8 | | | 44.2 | 12.4 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 32.2 | 50.3 | | | 49.7 | 16.0 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 32.1 | 50.0 | | | 50.0 | 16.1 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 31.5 | 51.3 | | | 48.7 | 15.3 |
| ChemCatChem 5 (2013) 3725-3735 | La/MgO | 923 | 3.0 | 1.0 | | 32.3 | 52.0 | | | 48.0 | 15.5 |
| Fuel 106 (2013) 851-857 | Na2WO4/Mn/SiO2 | 1033 | 3.5 | 1.0 | | 20.0 | 60.0 | | | 40.0 | 8.0 |
| Fuel 106 (2013) 851-857 | Na2WO4/Mn/SiO2 | 1063 | 3.5 | 1.0 | | 24.0 | 59.0 | | | 41.0 | 9.8 |
| Fuel 106 (2013) 851-857 | Na2WO4/Mn/SiO2 | 1093 | 3.5 | 1.0 | | 31.0 | 54.0 | | | 46.0 | 14.3 |
| Fuel 106 (2013) 851-857 | Na2WO4/Mn/SiO2 | 1123 | 3.5 | 1.0 | | 33.0 | 55.0 | | | 45.0 | 14.9 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1123 | 3.0 | 1.0 | | 37.0 | 43.0 | | | 57.0 | 21.1 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1123 | 4.0 | 1.0 | | 30.0 | 38.0 | | | 62.0 | 18.6 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1123 | 5.0 | 1.0 | | 25.0 | 35.0 | | | 65.0 | 16.3 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1123 | 6.0 | 1.0 | | 22.0 | 33.0 | | | 67.0 | 14.7 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1048 | 4.0 | 1.0 | | 20.5 | 54.0 | | | 46.0 | 9.4 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1073 | 4.0 | 1.0 | | 24.0 | 46.0 | | | 54.0 | 13.0 |
| Fuel Proc Techn 115 (2013) 79-87 | Na2WO4/Mn/SiO2 | 1098 | 4.0 | 1.0 | | 27.5 | 42.0 | | | 58.0 | 16.0 |
| Nanoscale 5 (2013) 10844-10848 | La2O3 | 723 | 3.0 | 1.0 | | 26.0 | 62.0 | | | 38.0 | 9.9 |
| Nanoscale 5 (2013) 10844-10848 | La2O3 | 923 | 3.0 | 1.0 | | 26.0 | 57.5 | | | 42.5 | 11.1 |
| Pol J Chem Tech 15 (2013) 22-26 | CeO2 | 1073 | 3.7 | 1.0 | | 13.2 | 55.9 | 10.2 | 33.9 | 44.1 | 5.8 |
| Pol J Chem Tech 15 (2013) 22-26 | Ca/CeO2 | 1073 | 3.7 | 1.0 | | 19.4 | 63.0 | 13.5 | 22.6 | 36.1 | 7.0 |
| Pol J Chem Tech 15 (2013) 22-26 | La/CeO2 | 1073 | 3.7 | 1.0 | | 18.4 | 69.3 | 12.4 | 17.8 | 30.2 | 5.6 |
| Reac Kinet Mech Cat 110 (2013) 373-385 | Li/MgO | 1023 | 2.0 | 1.0 | | 44.2 | 60.1 | 28.5 | 11.4 | 39.9 | 17.6 |
| Reac Kinet Mech Cat 110 (2013) 373-385 | Li/MgO | 948 | 2.0 | 1.0 | | 40.0 | 56.7 | 35.1 | 8.2 | 43.3 | 17.3 |
| Reac Kinet Mech Cat 110 (2013) 373-385 | Li/MgO | 998 | 2.0 | 1.0 | | 35.1 | 39.2 | 50.9 | 9.9 | 60.8 | 21.4 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/SiO2 | 923 | 3.0 | 1.0 | | 9.0 | 60.0 | | | 40.0 | 3.6 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/SiO2 | 973 | 3.0 | 1.0 | | 20.0 | 59.0 | | | 41.0 | 8.2 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/SiO2 | 1023 | 3.0 | 1.0 | | 18.5 | 59.0 | | | 41.0 | 7.6 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/Al2O3 | 973 | 3.0 | 1.0 | | 9.0 | 97.0 | | | 3.0 | 0.3 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/Al2O3 | 1023 | 3.0 | 1.0 | | 9.0 | 93.0 | | | 7.0 | 0.6 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/Al2O3 | 1073 | 3.0 | 1.0 | | 8.5 | 97.4 | | | 2.6 | 0.2 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/NaX | 973 | 3.0 | 1.0 | | 7.3 | 94.0 | | | 6.0 | 0.4 |
| Russ J Appl Chem 86 (2013) 458-461 | Na-Mn/NaX | 1023 | 3.0 | 1.0 | | 9.0 | 91.0 | | | 9.0 | 0.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 998 | 5.0 | 1.0 | | 2.8 | 76.5 | | | 23.5 | 0.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1023 | 5.0 | 1.0 | | 9.9 | 76.1 | | | 23.9 | 2.4 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--------------------------------------|----------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1048 | 5.0 | 1.0 | | 22.6 | 62.5 | | | 37.5 | 8.5 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1073 | 5.0 | 1.0 | | 34.0 | 59.8 | | | 40.2 | 13.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1098 | 5.0 | 1.0 | | 37.5 | 59.4 | | | 40.6 | 15.2 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1123 | 5.0 | 1.0 | | 39.1 | 58.7 | | | 41.3 | 16.1 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 998 | 5.0 | 1.0 | | 11.2 | 72.5 | | | 27.5 | 3.1 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1023 | 5.0 | 1.0 | | 25.7 | 58.1 | | | 41.9 | 10.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1048 | 5.0 | 1.0 | | 37.1 | 55.4 | | | 44.6 | 16.5 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1073 | 5.0 | 1.0 | | 41.4 | 56.9 | | | 43.1 | 17.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1098 | 5.0 | 1.0 | | 42.4 | 57.3 | | | 42.7 | 18.1 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1123 | 5.0 | 1.0 | | 42.4 | 58.3 | | | 41.7 | 17.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 998 | 5.0 | 1.0 | | 1.4 | 68.9 | | | 31.1 | 0.4 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1023 | 5.0 | 1.0 | | 4.3 | 62.8 | | | 37.2 | 1.6 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1048 | 5.0 | 1.0 | | 9.2 | 49.4 | | | 50.6 | 4.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1073 | 5.0 | 1.0 | | 15.8 | 38.2 | | | 61.8 | 9.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1098 | 5.0 | 1.0 | | 40.9 | 56.0 | | | 44.0 | 18.0 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1123 | 5.0 | 1.0 | | 42.0 | 59.0 | | | 41.0 | 17.2 |
| Patent 11.06.2013: US2013/0178680 A1 | TiO2 | 998 | 2.0 | 1.0 | | 1.4 | 71.4 | | | 28.6 | 0.4 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 998 | 2.0 | 1.0 | | 2.8 | 76.5 | | | 23.5 | 0.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 998 | 2.0 | 1.0 | | 11.2 | 72.5 | | | 27.5 | 3.1 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 998 | 2.0 | 1.0 | | 1.4 | 68.9 | | | 31.1 | 0.4 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO | 998 | 2.0 | 1.0 | | 3.8 | 88.8 | | | 11.2 | 0.4 |
| Patent 11.06.2013: US2013/0178680 A1 | TiO2 | 1023 | 2.0 | 1.0 | | 2.1 | 52.6 | | | 47.4 | 1.0 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1023 | 2.0 | 1.0 | | 9.9 | 76.1 | | | 23.9 | 2.4 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1023 | 2.0 | 1.0 | | 25.7 | 58.1 | | | 41.9 | 10.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1023 | 2.0 | 1.0 | | 4.3 | 62.8 | | | 37.2 | 1.6 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO | 1023 | 2.0 | 1.0 | | 4.9 | 65.1 | | | 34.9 | 1.7 |
| Patent 11.06.2013: US2013/0178680 A1 | TiO2 | 1048 | 2.0 | 1.0 | | 5.0 | 50.5 | | | 49.5 | 2.5 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1048 | 2.0 | 1.0 | | 22.6 | 62.5 | | | 37.5 | 8.5 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1048 | 2.0 | 1.0 | | 37.1 | 55.4 | | | 44.6 | 16.5 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1048 | 2.0 | 1.0 | | 9.2 | 49.4 | | | 50.6 | 4.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO | 1048 | 2.0 | 1.0 | | 10.6 | 59.8 | | | 40.2 | 4.3 |
| Patent 11.06.2013: US2013/0178680 A1 | TiO2 | 1073 | 2.0 | 1.0 | | 11.8 | 48.9 | | | 51.1 | 6.0 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1073 | 2.0 | 1.0 | | 34.0 | 59.8 | | | 40.2 | 13.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1073 | 2.0 | 1.0 | | 41.4 | 56.9 | | | 43.1 | 17.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1073 | 2.0 | 1.0 | | 15.8 | 38.2 | | | 61.8 | 9.8 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO | 1073 | 2.0 | 1.0 | | 11.9 | 46.9 | | | 53.1 | 6.3 |
| Patent 11.06.2013: US2013/0178680 A1 | TiO2 | 1098 | 2.0 | 1.0 | | 23.9 | 48.6 | | | 51.4 | 12.3 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1098 | 2.0 | 1.0 | | 37.5 | 59.4 | | | 40.6 | 15.2 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1098 | 2.0 | 1.0 | | 42.4 | 57.3 | | | 42.7 | 18.1 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1098 | 2.0 | 1.0 | | 40.9 | 56.0 | | | 44.0 | 18.0 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO | 1098 | 2.0 | 1.0 | | 16.3 | 43.1 | | | 56.9 | 9.3 |
| Patent 11.06.2013: US2013/0178680 A1 | TiO2 | 1123 | 2.0 | 1.0 | | 37.3 | 54.4 | | | 45.6 | 17.0 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1123 | 2.0 | 1.0 | | 39.1 | 58.7 | | | 41.3 | 16.1 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--------------------------------------|-----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|---------------------|---------------------|---------------------|
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1123 | 2.0 | 1.0 | | 42.4 | 58.3 | | | 41.7 | 17.7 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO-TiO2 | 1123 | 2.0 | 1.0 | | 42.0 | 59.0 | | | 41.0 | 17.2 |
| Patent 11.06.2013: US2013/0178680 A1 | MgO | 1123 | 2.0 | 1.0 | | 29.8 | 49.2 | | | 50.8 | 15.1 |
| ACS Catal 4 (2014) 1972 | Sm/MgO | 973 | 4.0 | 1.0 | | 21.3 | 48.8 | 26.3 | 25.3 | 51.6 | 11.0 |
| ACS Catal 4 (2014) 1972 | Sm/MgO | 973 | 4.0 | 1.0 | | 20.8 | 48.8 | 23.8 | 27.4 | 51.2 | 10.6 |
| ACS Catal 4 (2014) 1972 | SmLi/MgO | 973 | 4.0 | 1.0 | | 21.2 | 38.2 | 38.1 | 23.7 | 61.8 | 13.1 |
| ACS Catal 4 (2014) 1972 | SmLi/MgO | 973 | 4.0 | 1.0 | | 20.4 | 44.7 | 32.3 | 23.0 | 55.3 | 11.3 |
| ACS Catal 4 (2014) 1972 | SmLi/MgO | 973 | 4.0 | 1.0 | | 21.1 | 39.0 | 38.2 | 22.8 | 61.0 | 12.9 |
| ACS Catal 4 (2014) 1972 | SmLi/MgO | 973 | 4.0 | 1.0 | | 20.8 | 40.1 | 38.8 | 21.1 | 59.9 | 12.5 |
| ACS Catal 4 (2014) 1972 | SmLi/MgO | 973 | 4.0 | 1.0 | | 22.2 | 43.0 | 33.6 | 23.4 | 57.0 | 12.7 |
| ACS Catal 4 (2014) 1972 | SmLi/MgO | 973 | 4.0 | 1.0 | | 22.0 | 41.0 | 31.8 | 27.2 | 59.0 | 13.0 |
| ACS Catal 4 (2014) 1972 | Tb/MgO | 973 | 4.0 | 1.0 | | 17.2 | 61.4 | 16.3 | 22.3 | 38.6 | 6.6 |
| ACS Catal 4 (2014) 1972 | Tb/MgO | 973 | 4.0 | 1.0 | | 18.6 | 56.1 | 17.7 | 26.2 | 43.9 | 8.2 |
| ACS Catal 4 (2014) 1972 | TbLi/MgO | 973 | 4.0 | 1.0 | | 21.8 | 38.3 | 37.9 | 23.8 | 61.7 | 13.5 |
| ACS Catal 4 (2014) 1972 | TbLi/MgO | 973 | 4.0 | 1.0 | | 22.1 | 43.0 | 29.7 | 27.3 | 57.0 | 12.6 |
| ACS Catal 4 (2014) 1972 | TbLi/MgO | 973 | 4.0 | 1.0 | | 23.9 | 37.8 | 36.8 | 25.4 | 62.2 | 14.9 |
| ACS Catal 4 (2014) 1972 | TbLi/MgO | 973 | 4.0 | 1.0 | | 22.1 | 38.0 | 37.9 | 24.1 | 62.0 | 13.7 |
| ACS Catal 4 (2014) 1972 | TbLi/MgO | 973 | 4.0 | 1.0 | | 22.0 | 43.4 | 28.8 | 27.8 | 56.6 | 12.5 |
| ACS Catal 4 (2014) 1972 | TbLi/MgO | 973 | 4.0 | 1.0 | | 21.6 | 45.3 | 25.7 | 29.0 | 54.7 | 11.8 |
| Appl Catal A 485(2014) 10-19 | SrTiO3 | 1123 | 2.0 | 1.0 | | 16.5 | 53.2 | 15.1 | 31.7 | 46.8 | 7.7 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9PbO,1O3 | 1123 | 2.0 | 1.0 | | 15.8 | 34.9 | 19.1 | 46.0 | 65.1 | 10.3 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9MgO,1O3 | 1123 | 2.0 | 1.0 | | 39.9 | 49.9 | 22.8 | 27.3 | 50.1 | 20.0 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9CaO,1O3 | 1123 | 2.0 | 1.0 | | 12.3 | 31.5 | 16.3 | 52.2 | 68.5 | 8.4 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9BaO,1O3 | 1123 | 2.0 | 1.0 | | 9.8 | 32.8 | 15.3 | 51.9 | 67.2 | 6.6 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9AlO,1O3 | 1123 | 2.0 | 1.0 | | 27.9 | 36.9 | 24.3 | 38.8 | 63.1 | 17.6 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO4 | 1123 | 2.0 | 1.0 | | 20.3 | 40.3 | 22.1 | 37.6 | 59.7 | 12.1 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9MgO,1O4 | 1123 | 2.0 | 1.0 | | 29.7 | 34.7 | 28.4 | 36.9 | 65.3 | 19.4 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9AlO,1O4 | 1123 | 2.0 | 1.0 | | 18.5 | 29.8 | 19.5 | 50.7 | 70.2 | 13.0 |
| Appl Catal A 485(2014) 10-19 | SrTiO3 | 1123 | 4.0 | 1.0 | | 15.0 | 37.4 | 20.9 | 41.7 | 62.6 | 9.4 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9PbO,1O3 | 1123 | 4.0 | 1.0 | | 18.3 | 28.3 | 21.7 | 50.0 | 71.7 | 13.1 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9MgO,1O3 | 1123 | 4.0 | 1.0 | | 24.2 | 36.0 | 27.8 | 36.2 | 64.0 | 15.5 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9CaO,1O3 | 1123 | 4.0 | 1.0 | | 13.6 | 22.9 | 21.4 | 55.7 | 77.1 | 10.5 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9BaO,1O3 | 1123 | 4.0 | 1.0 | | 12.3 | 26.3 | 17.1 | 56.6 | 73.7 | 9.1 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9AlO,1O3 | 1123 | 4.0 | 1.0 | | 20.3 | 25.2 | 28.8 | 46.0 | 74.8 | 15.2 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO4 | 1123 | 4.0 | 1.0 | | 21.1 | 31.3 | 27.5 | 41.2 | 68.7 | 14.5 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9MgO,1O4 | 1123 | 4.0 | 1.0 | | 23.9 | 24.4 | 31.5 | 44.1 | 75.6 | 18.1 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9AlO,1O4 | 1123 | 4.0 | 1.0 | | 17.4 | 20.8 | 23.3 | 55.9 | 79.2 | 13.8 |
| Appl Catal A 485(2014) 10-19 | SrTiO3 | 1173 | 2.0 | 1.0 | | 15.4 | 49.3 | 14.5 | 36.2 | 50.7 | 7.8 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9PbO,1O3 | 1173 | 2.0 | 1.0 | | 22.0 | 45.4 | 21.8 | 32.8 | 54.6 | 12.0 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9MgO,1O3 | 1173 | 2.0 | 1.0 | | 35.6 | 55.3 | 20.3 | 24.4 | 44.7 | 15.9 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9CaO,1O3 | 1173 | 2.0 | 1.0 | | 15.6 | 32.8 | 21.7 | 45.5 | 67.2 | 10.5 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9BaO,1O3 | 1173 | 2.0 | 1.0 | | 15.4 | 29.2 | 19.7 | 51.1 | 70.8 | 10.9 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9AlO,1O3 | 1173 | 2.0 | 1.0 | | 34.5 | 49.5 | 25.3 | 25.3 | 50.5 | 17.4 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------|-----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|---------------------|---------------------|---------------------|
| Appl Catal A 485(2014) 10-19 | Sr2TiO4 | 1173 | 2.0 | 1.0 | | 32.6 | 43.0 | 25.9 | 31.1 | 57.0 | 18.6 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9MgO,1O4 | 1173 | 2.0 | 1.0 | | 37.1 | 41.8 | 29.1 | 29.1 | 58.2 | 21.6 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9AlO,1O4 | 1173 | 2.0 | 1.0 | | 26.7 | 30.6 | 30.2 | 39.2 | 69.4 | 18.5 |
| Appl Catal A 485(2014) 10-19 | SrTiO3 | 1173 | 4.0 | 1.0 | | 19.4 | 34.1 | 23.5 | 42.4 | 65.9 | 12.8 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9PbO,1O3 | 1173 | 4.0 | 1.0 | | 21.4 | 35.5 | 24.8 | 39.7 | 64.5 | 13.8 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9MgO,1O3 | 1173 | 4.0 | 1.0 | | 22.1 | 44.3 | 24.2 | 31.5 | 55.7 | 12.3 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9CaO,1O3 | 1173 | 4.0 | 1.0 | | 14.6 | 26.5 | 21.6 | 51.9 | 73.5 | 10.7 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9BaO,1O3 | 1173 | 4.0 | 1.0 | | 17.0 | 21.6 | 28.0 | 50.4 | 78.4 | 13.3 |
| Appl Catal A 485(2014) 10-19 | SrTiO,9AlO,1O3 | 1173 | 4.0 | 1.0 | | 24.3 | 32.8 | 30.5 | 36.7 | 67.2 | 16.3 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO4 | 1173 | 4.0 | 1.0 | | 25.3 | 31.5 | 29.8 | 38.7 | 68.5 | 17.3 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9MgO,1O4 | 1173 | 4.0 | 1.0 | | 28.2 | 28.8 | 33.9 | 37.3 | 71.2 | 20.1 |
| Appl Catal A 485(2014) 10-19 | Sr2TiO,9AlO,1O4 | 1173 | 4.0 | 1.0 | | 24.3 | 25.2 | 34.0 | 40.8 | 74.8 | 18.2 |
| Catal Commu 50 (2014) 54-58 | Rh-TiO2 | 1023 | 5.0 | 1.0 | | 25.5 | 100.0 | | | 0.0 | 0.0 |
| Catal Commu 50 (2014) 54-58 | Rh-TiO2 | 1048 | 5.0 | 1.0 | | 27.0 | 100.0 | | | 0.0 | 0.0 |
| Catal Commu 50 (2014) 54-58 | Rh-TiO2 | 1073 | 5.0 | 1.0 | | 27.5 | 100.0 | | | 0.0 | 0.0 |
| Catal Commu 50 (2014) 54-58 | Rh-TiO2 | 1098 | 5.0 | 1.0 | | 28.5 | 100.0 | | | 0.0 | 0.0 |
| Catal Commu 50 (2014) 54-58 | Rh-TiO2 | 1123 | 5.0 | 1.0 | | 29.0 | 100.0 | | | 0.0 | 0.0 |
| Catal Commu 50 (2014) 54-58 | Mn-TiO2 | 1023 | 5.0 | 1.0 | | 14.0 | 64.0 | | | 36.0 | 5.0 |
| Catal Commu 50 (2014) 54-58 | Mn-TiO2 | 1048 | 5.0 | 1.0 | | 15.0 | 52.0 | | | 48.0 | 7.2 |
| Catal Commu 50 (2014) 54-58 | Mn-TiO2 | 1073 | 5.0 | 1.0 | | 17.5 | 46.0 | | | 54.0 | 9.5 |
| Catal Commu 50 (2014) 54-58 | Mn-TiO2 | 1098 | 5.0 | 1.0 | | 18.0 | 45.0 | | | 55.0 | 9.9 |
| Catal Commu 50 (2014) 54-58 | Mn-TiO2 | 1123 | 5.0 | 1.0 | | 20.0 | 45.0 | | | 55.0 | 11.0 |
| Catal Commu 50 (2014) 54-58 | V-TiO2 | 1023 | 5.0 | 1.0 | | 3.0 | 97.5 | | | 2.5 | 0.1 |
| Catal Commu 50 (2014) 54-58 | V-TiO2 | 1048 | 5.0 | 1.0 | | 4.0 | 96.0 | | | 4.0 | 0.2 |
| Catal Commu 50 (2014) 54-58 | V-TiO2 | 1073 | 5.0 | 1.0 | | 6.0 | 95.0 | | | 5.0 | 0.3 |
| Catal Commu 50 (2014) 54-58 | V-TiO2 | 1098 | 5.0 | 1.0 | | 11.0 | 95.0 | | | 5.0 | 0.6 |
| Catal Commu 50 (2014) 54-58 | V-TiO2 | 1123 | 5.0 | 1.0 | | 12.5 | 92.5 | | | 7.5 | 0.9 |
| Catal Commu 50 (2014) 54-58 | TiO2 | 1023 | 5.0 | 1.0 | | 2.0 | 62.0 | | | 38.0 | 0.8 |
| Catal Commu 50 (2014) 54-58 | TiO2 | 1048 | 5.0 | 1.0 | | 2.5 | 63.0 | | | 37.0 | 0.9 |
| Catal Commu 50 (2014) 54-58 | TiO2 | 1073 | 5.0 | 1.0 | | 3.0 | 61.0 | | | 39.0 | 1.2 |
| Catal Commu 50 (2014) 54-58 | TiO2 | 1098 | 5.0 | 1.0 | | 5.0 | 62.0 | | | 38.0 | 1.9 |
| Catal Commu 50 (2014) 54-58 | TiO2 | 1123 | 5.0 | 1.0 | | 7.5 | 57.0 | | | 43.0 | 3.2 |
| Catalysis Today 228 (2014) 5-14 | La2O3 | 1023 | 4.0 | 1.0 | 99.0 | 20.0 | 54.0 | | | 46.0 | 9.2 |
| Catalysis Today 228 (2014) 5-14 | WO3/La2O3 | 1023 | 4.0 | 1.0 | 20.0 | 4.0 | 52.0 | | | 48.0 | 1.9 |
| Catalysis Today 228 (2014) 5-14 | Mn/La2O3 | 1023 | 4.0 | 1.0 | 99.5 | 21.0 | 58.0 | | | 42.0 | 8.8 |
| Catalysis Today 228 (2014) 5-14 | Na2WO4/La2O3 | 1023 | 4.0 | 1.0 | 66.0 | 13.0 | 55.0 | | | 45.0 | 5.9 |
| Catalysis Today 228 (2014) 5-14 | Na2WO4/Mn/La2O3 | 1023 | 4.0 | 1.0 | 93.0 | 18.0 | 66.0 | | | 34.0 | 6.1 |
| Catalysis Today 228 (2014) 5-14 | CaO | 1023 | 4.0 | 1.0 | 68.0 | 12.0 | 72.0 | | | 28.0 | 3.4 |
| Catalysis Today 228 (2014) 5-14 | WO3/CaO | 1023 | 4.0 | 1.0 | 50.0 | 8.0 | 68.0 | | | 32.0 | 2.6 |
| Catalysis Today 228 (2014) 5-14 | Mn/CaO | 1023 | 4.0 | 1.0 | 100.0 | 16.0 | 80.0 | | | 20.0 | 3.2 |
| Catalysis Today 228 (2014) 5-14 | Na2WO4/CaO | 1023 | 4.0 | 1.0 | 58.0 | 10.0 | 70.0 | | | 30.0 | 3.0 |
| Catalysis Today 228 (2014) 5-14 | Na2WO4/Mn/CaO | 1023 | 4.0 | 1.0 | 99.0 | 18.0 | 72.0 | | | 28.0 | 5.0 |
| Catalysis Today 228 (2014) 5-14 | Al2O3 | 1023 | 4.0 | 1.0 | 56.0 | 4.0 | 87.0 | | | 13.0 | 0.5 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------|--|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Catalysis Today 228 (2014) 5-14 | WO ₃ /Al ₂ O ₃ | 1023 | 4.0 | 1.0 | 9.0 | 1.0 | 92.0 | | | 8.0 | 0.1 |
| Catalysis Today 228 (2014) 5-14 | Mn/Al ₂ O ₃ | 1023 | 4.0 | 1.0 | 99.0 | 13.0 | 92.0 | | | 8.0 | 1.0 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Al ₂ O ₃ | 1023 | 4.0 | 1.0 | 98.0 | 8.0 | 98.0 | | | 2.0 | 0.2 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/Al ₂ O ₃ | 1023 | 4.0 | 1.0 | 97.0 | 13.0 | 75.0 | | | 25.0 | 3.3 |
| Catalysis Today 228 (2014) 5-14 | ZrO ₂ | 1023 | 4.0 | 1.0 | 98.0 | 11.0 | 78.0 | | | 22.0 | 2.4 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /ZrO ₂ | 1023 | 4.0 | 1.0 | 7.0 | 1.0 | 60.0 | | | 40.0 | 0.4 |
| Catalysis Today 228 (2014) 5-14 | Mn/ZrO ₂ | 1023 | 4.0 | 1.0 | 100.0 | 15.0 | 88.0 | | | 12.0 | 1.8 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /ZrO ₂ | 1023 | 4.0 | 1.0 | 15.0 | 3.0 | 56.0 | | | 44.0 | 1.3 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/ZrO ₂ | 1023 | 4.0 | 1.0 | 67.0 | 10.0 | 79.0 | | | 21.0 | 2.1 |
| Catalysis Today 228 (2014) 5-14 | SiO ₂ | 1023 | 4.0 | 1.0 | 11.0 | 1.0 | 31.0 | | | 69.0 | 0.7 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /SiO ₂ | 1023 | 4.0 | 1.0 | 6.0 | 1.0 | 17.0 | | | 83.0 | 0.8 |
| Catalysis Today 228 (2014) 5-14 | Mn/SiO ₂ | 1023 | 4.0 | 1.0 | 31.0 | 4.0 | 77.0 | | | 23.0 | 0.9 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /SiO ₂ | 1023 | 4.0 | 1.0 | 16.0 | 2.0 | 43.0 | | | 57.0 | 1.1 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | 37.0 | 7.0 | 42.0 | | | 58.0 | 4.1 |
| Catalysis Today 228 (2014) 5-14 | SiC | 1023 | 4.0 | 1.0 | 4.0 | 1.0 | 52.0 | | | 48.0 | 0.5 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /SiC | 1023 | 4.0 | 1.0 | 3.0 | 1.0 | 44.0 | | | 56.0 | 0.6 |
| Catalysis Today 228 (2014) 5-14 | Mn/SiC | 1023 | 4.0 | 1.0 | 42.0 | 5.0 | 83.0 | | | 17.0 | 0.9 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /SiC | 1023 | 4.0 | 1.0 | 8.0 | 2.0 | 55.0 | | | 45.0 | 0.9 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/SiC | 1023 | 4.0 | 1.0 | 14.0 | 4.0 | 38.0 | | | 62.0 | 2.5 |
| Catalysis Today 228 (2014) 5-14 | MgO | 1023 | 4.0 | 1.0 | 56.0 | 8.0 | 66.0 | | | 34.0 | 2.7 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /MgO | 1023 | 4.0 | 1.0 | 7.0 | 1.0 | 60.0 | | | 40.0 | 0.4 |
| Catalysis Today 228 (2014) 5-14 | Mn/MgO | 1023 | 4.0 | 1.0 | 100.0 | 15.0 | 91.0 | | | 9.0 | 1.4 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /MgO | 1023 | 4.0 | 1.0 | 5.0 | 1.0 | 56.0 | | | 44.0 | 0.4 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/MgO | 1023 | 4.0 | 1.0 | 26.0 | 4.0 | 74.0 | | | 26.0 | 1.0 |
| Catalysis Today 228 (2014) 5-14 | Fe ₂ O ₃ | 1023 | 4.0 | 1.0 | 28.0 | 2.0 | 87.0 | | | 13.0 | 0.3 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /Fe ₂ O ₃ | 1023 | 4.0 | 1.0 | 21.0 | 1.0 | 45.0 | | | 55.0 | 0.6 |
| Catalysis Today 228 (2014) 5-14 | Mn/Fe ₂ O ₃ | 1023 | 4.0 | 1.0 | 43.0 | 6.0 | 81.0 | | | 19.0 | 1.1 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Fe ₂ O ₃ | 1023 | 4.0 | 1.0 | 6.0 | 2.0 | 23.0 | | | 77.0 | 1.5 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/Fe ₂ O ₃ | 1023 | 4.0 | 1.0 | 11.0 | 2.0 | 27.5 | | | 72.5 | 1.5 |
| Catalysis Today 228 (2014) 5-14 | Fe ₃ O ₄ | 1023 | 4.0 | 1.0 | 79.0 | 10.0 | 96.0 | | | 4.0 | 0.4 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /Fe ₃ O ₄ | 1023 | 4.0 | 1.0 | 15.0 | 1.0 | 57.0 | | | 43.0 | 0.4 |
| Catalysis Today 228 (2014) 5-14 | Mn/Fe ₃ O ₄ | 1023 | 4.0 | 1.0 | 82.0 | 10.0 | 94.0 | | | 6.0 | 0.6 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Fe ₃ O ₄ | 1023 | 4.0 | 1.0 | 6.0 | 1.0 | 25.0 | | | 75.0 | 0.8 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/Fe ₃ O ₄ | 1023 | 4.0 | 1.0 | 8.0 | 2.0 | 37.0 | | | 63.0 | 1.3 |
| Catalysis Today 228 (2014) 5-14 | SrO | 1023 | 4.0 | 1.0 | 16.0 | 3.0 | 67.0 | | | 33.0 | 1.0 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /SrO | 1023 | 4.0 | 1.0 | 14.0 | 4.0 | 37.0 | | | 63.0 | 2.5 |
| Catalysis Today 228 (2014) 5-14 | Mn/SrO | 1023 | 4.0 | 1.0 | 31.0 | 6.0 | 72.0 | | | 28.0 | 1.7 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /SrO | 1023 | 4.0 | 1.0 | 16.0 | 3.0 | 64.0 | | | 36.0 | 1.1 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/SrO | 1023 | 4.0 | 1.0 | 30.0 | 5.0 | 76.0 | | | 24.0 | 1.2 |
| Catalysis Today 228 (2014) 5-14 | TiO ₂ | 1023 | 4.0 | 1.0 | 16.0 | 3.0 | 71.0 | | | 29.0 | 0.9 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /TiO ₂ | 1023 | 4.0 | 1.0 | 6.0 | 1.0 | 53.0 | | | 47.0 | 0.5 |
| Catalysis Today 228 (2014) 5-14 | Mn/TiO ₂ | 1023 | 4.0 | 1.0 | 41.0 | 6.0 | 53.0 | | | 47.0 | 2.8 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /TiO ₂ | 1023 | 4.0 | 1.0 | 5.0 | 2.0 | 19.0 | | | 81.0 | 1.6 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | p(CH ₄)/p(O ₂) | p _{total} , bar | X(O ₂), % | X(CH ₄), % | S(CO _x), % | S(C ₂ ⁻), % | S(C ₂ -), % | S(C ₂), % | Y(C ₂), % |
|--|--|----------|--|--------------------------|-----------------------|------------------------|------------------------|------------------------------------|------------------------|-----------------------|-----------------------|
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/TiO ₂ | 1023 | 4.0 | 1.0 | 12.0 | 4.0 | 21.0 | | | 79.0 | 3.2 |
| Catalysis Today 228 (2014) 5-14 | TiO ₂ | 1023 | 4.0 | 1.0 | 20.0 | 3.0 | 79.0 | | | 21.0 | 0.6 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ /TiO ₂ | 1023 | 4.0 | 1.0 | 6.0 | 1.0 | 28.0 | | | 72.0 | 0.7 |
| Catalysis Today 228 (2014) 5-14 | Mn/TiO ₂ | 1023 | 4.0 | 1.0 | 21.0 | 4.0 | 72.0 | | | 28.0 | 1.1 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /TiO ₂ | 1023 | 4.0 | 1.0 | 6.0 | 2.0 | 26.0 | | | 74.0 | 1.5 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ /Mn/TiO ₂ | 1023 | 4.0 | 1.0 | 8.0 | 2.5 | 36.0 | | | 64.0 | 1.6 |
| Catalysis Today 228 (2014) 5-14 | WO ₃ | 1023 | 4.0 | 1.0 | 3.0 | 1.0 | 55.0 | | | 45.0 | 0.5 |
| Catalysis Today 228 (2014) 5-14 | Mn ₂ O ₃ | 1023 | 4.0 | 1.0 | 77.0 | 10.0 | 85.0 | | | 15.0 | 1.5 |
| Catalysis Today 228 (2014) 5-14 | Na ₂ WO ₄ | 1023 | 4.0 | 1.0 | 4.0 | 2.0 | 24.0 | | | 76.0 | 1.5 |
| Catalysis Today 228 (2014) 5-14 | Mn-Na ₂ WO ₄ | 1023 | 4.0 | 1.0 | 8.0 | 3.0 | 23.0 | | | 77.0 | 2.3 |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 3.0 | 17.5 | | 50.0 | | | 50.0 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 4.0 | 19.0 | | 50.0 | | | 50.0 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 5.0 | 22.5 | | 48.0 | | | 52.0 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 6.0 | 26.0 | | 48.0 | | | 52.0 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 7.0 | 42.0 | | 46.0 | | | 53.5 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 8.0 | 47.5 | | 46.0 | | | 53.0 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 9.0 | 71.0 | | 44.0 | | | 54.0 | |
| Catalysis Today 228 (2014) 212-218 | Mn/Na ₂ WO ₄ /SiO ₂ | 973 | 19.0 | 10.0 | 83.0 | | 40.0 | | | 55.0 | |
| Catalysis Today 236 (2014) 12-22 | Mn/Na ₂ WO ₄ /SiO ₂ | 1098 | 2.5 | 1.0 | | 26.5 | 27.8 | | | 72.2 | 19.1 |
| Catalysis Today 236 (2014) 12-22 | Mn/Na ₂ WO ₄ /SiO ₂ | 1098 | 2.5 | 1.0 | | 35.4 | 41.9 | | | 58.1 | 20.6 |
| Catalysis Today 236 (2014) 12-22 | Mn/Na ₂ WO ₄ /SiO ₂ | 1098 | 3.0 | 1.0 | | 26.8 | 40.4 | | | 59.6 | 16.0 |
| Chem Comm 50 (2014) 14440-14442 | Na-W-Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 14.0 | 35.0 | | | 65.0 | 9.1 |
| Chem Comm 50 (2014) 14440-14442 | Na-W-Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 6.0 | 41.0 | | | 59.0 | 3.5 |
| Chem Comm 50 (2014) 14440-14442 | Na-W-Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 2.0 | 47.5 | | | 52.5 | 1.1 |
| Chemie Ingenieur Technik 86 (2014) 1894-1900 | Na-W-Mn/SiO ₂ | 1123 | 4.0 | 1.0 | | 32.0 | 32.0 | | | 68.0 | 21.8 |
| Chemie Ingenieur Technik 86 (2014) 1894-1900 | Na-W-Mn/SiO ₂ | 1123 | 2.0 | 1.0 | | 48.0 | 48.0 | | | 52.0 | 25.0 |
| Chemie Ingenieur Technik 86 (2014) 1894-1900 | Na-W-Mn/SiO ₂ | 1123 | 1.0 | 1.0 | | 72.0 | 78.0 | | | 22.0 | 15.8 |
| ChemCatChem 6 (2014) 1245-1251 | Na ₂ WO ₄ /SiO ₂ | 1153 | 3.0 | 1.0 | | 36.9 | 31.7 | 48.0 | 15.8 | 63.8 | 23.5 |
| ChemCatChem 6 (2014) 2815-2820 | Ce-LaO ₃ | 1288 | 4.0 | 1.0 | | 30.0 | 45.0 | | | 55.0 | 16.5 |
| Dalton Trans. 43 (2014) 8690-8697 | NH ₄ -La-ptda | 873 | 2.8 | 1.0 | | 13.0 | 72.0 | | | 28.0 | 3.6 |
| Dalton Trans. 43 (2014) 8690-8697 | NH ₄ -La-ptda | 923 | 2.8 | 1.0 | | 17.0 | 57.5 | | | 42.5 | 7.2 |
| Dalton Trans. 43 (2014) 8690-8697 | NH ₄ -La-ptda | 973 | 2.8 | 1.0 | | 23.0 | 54.0 | | | 46.0 | 10.6 |
| Dalton Trans. 43 (2014) 8690-8697 | NH ₄ -La-ptda | 1023 | 2.8 | 1.0 | | 29.0 | 53.5 | | | 46.5 | 13.5 |
| Dalton Trans. 43 (2014) 8690-8697 | NH ₄ -La-ptda | 1073 | 2.8 | 1.0 | | 30.0 | 54.5 | | | 45.5 | 13.7 |
| Dalton Trans. 43 (2014) 8690-8697 | Sr-La-ptda | 823 | 2.8 | 1.0 | | 12.0 | 76.0 | | | 24.0 | 2.9 |
| Dalton Trans. 43 (2014) 8690-8697 | Sr-La-ptda | 873 | 2.8 | 1.0 | | 26.0 | 53.0 | | | 47.0 | 12.2 |
| Dalton Trans. 43 (2014) 8690-8697 | Sr-La-ptda | 923 | 2.8 | 1.0 | | 29.5 | 54.0 | | | 46.0 | 13.6 |
| Dalton Trans. 43 (2014) 8690-8697 | Sr-La-ptda | 973 | 2.8 | 1.0 | | 29.0 | 50.0 | | | 50.0 | 14.5 |
| Dalton Trans. 43 (2014) 8690-8697 | Sr-La-ptda | 1023 | 2.8 | 1.0 | | 29.5 | 48.5 | | | 51.5 | 15.2 |
| Dalton Trans. 43 (2014) 8690-8697 | Sr-La-ptda | 1073 | 2.8 | 1.0 | | 31.0 | 49.0 | | | 51.0 | 15.8 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO ₂ | 1175 | 1.5 | 1.0 | 35.0 | 34.0 | 46.0 | 33.0 | 18.0 | 54.0 | 18.4 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO ₂ | 1015 | 2.1 | 1.0 | 3.0 | 1.0 | 20.0 | 16.0 | 64.0 | 80.0 | 0.8 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO ₂ | 1074 | 2.0 | 1.0 | 17.0 | 11.0 | 18.0 | 30.0 | 50.0 | 82.0 | 9.0 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1127 | 2.1 | 1.0 | 92.0 | 45.0 | 47.0 | 36.0 | 12.0 | 53.0 | 23.9 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1158 | 2.2 | 1.0 | 94.0 | 46.0 | 49.0 | 36.0 | 10.0 | 51.0 | 23.5 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1170 | 2.1 | 1.0 | 97.0 | 45.0 | 54.0 | 33.0 | 9.0 | 46.0 | 20.7 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1205 | 2.3 | 1.0 | 98.0 | 44.0 | 55.0 | 32.0 | 8.0 | 45.0 | 19.8 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1019 | 2.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1044 | 2.0 | 1.0 | 9.0 | 3.0 | 50.0 | 20.0 | 30.0 | 50.0 | 1.5 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1078 | 2.0 | 1.0 | 17.0 | 8.0 | 16.0 | 30.0 | 46.0 | 84.0 | 6.7 |
| Doklady Phys Chem 455 (2014) 60-63 | Li-W-Mn-SiO2 | 1178 | 2.0 | 1.0 | 85.0 | 38.0 | 35.0 | 43.0 | 16.0 | 65.0 | 24.7 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1004 | 1.9 | 1.0 | 12.0 | 4.0 | 36.0 | 7.0 | 43.0 | 64.0 | 2.6 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1056 | 1.8 | 1.0 | 33.0 | 16.0 | 35.0 | 28.0 | 34.0 | 65.0 | 10.4 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1153 | 1.9 | 1.0 | 99.0 | 46.0 | 52.0 | 33.0 | 10.0 | 48.0 | 22.1 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1175 | 1.8 | 1.0 | 99.0 | 46.0 | 54.0 | 32.0 | 9.0 | 46.0 | 21.2 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1121 | 2.2 | 1.0 | 84.0 | 30.0 | 47.0 | 33.0 | 17.0 | 53.0 | 15.9 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1152 | 2.2 | 1.0 | 93.0 | 35.0 | 43.0 | 37.0 | 15.0 | 57.0 | 20.0 |
| Doklady Phys Chem 455 (2014) 60-63 | Na-W-Mn-SiO2 | 1185 | 2.4 | 1.0 | 97.0 | 36.0 | 41.0 | 40.0 | 13.0 | 60.0 | 21.6 |
| Energy Fuels 28 (2014) 877-890 | Na2WO4/Mn/SiO2 | 1098 | 2.5 | | | 28.0 | 30.0 | | | 70.0 | 19.6 |
| Energy Fuels 28 (2014) 877-890 | Na2WO4/Mn/SiO2 | 1098 | 3.0 | | | 27.0 | 24.0 | | | 76.0 | 20.5 |
| Energy Fuels 28 (2014) 877-890 | Na2WO4/Mn/SiO2 | 1098 | 4.0 | | | 22.0 | 22.0 | | | 78.0 | 17.2 |
| Energy Fuels 28 (2014) 877-890 | Na2WO4/Mn/SiO2 | 1098 | 5.0 | | | 20.0 | 19.0 | | | 81.0 | 16.2 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 2.0 | 6.0 | | 29.0 | 28.9 | | | 71.1 | 20.6 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 2.2 | 6.0 | | 28.3 | 26.0 | | | 74.0 | 20.9 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 2.4 | 6.0 | | 27.5 | 24.4 | | | 75.6 | 20.8 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 2.5 | 6.0 | | 27.0 | 23.2 | | | 76.8 | 20.7 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 3.0 | 6.0 | | 24.6 | 19.4 | | | 80.6 | 19.8 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 4.0 | 6.0 | | 19.8 | 15.7 | | | 84.3 | 16.7 |
| J Ind and Eng Chem 20 (2014) 1993-2002 | Na2WO4/Mn/SiO2 | 1273 | 5.0 | 6.0 | | 15.9 | 13.8 | | | 86.2 | 13.7 |
| J Mol Liquids 191 (2014) 100-106 | KCl-LaCl3 | 1023 | 0.5 | 1.0 | | 6.0 | 26.0 | | | 74.0 | 4.4 |
| J Mol Liquids 191 (2014) 100-106 | KCl-CeCl3 | 1023 | 0.5 | 1.0 | | 12.5 | 59.0 | | | 41.0 | 5.1 |
| J Mol Liquids 191 (2014) 100-106 | KCl-SmCl3 | 1023 | 0.5 | 1.0 | | 21.0 | 30.0 | | | 70.0 | 14.7 |
| J Mol Liquids 191 (2014) 100-106 | KCl-DyCl3 | 1023 | 0.5 | 1.0 | | 34.0 | 45.0 | | | 55.0 | 18.7 |
| J Mol Liquids 191 (2014) 100-106 | KCl-YbCl3 | 1023 | 0.5 | 1.0 | | 25.0 | 39.0 | | | 61.0 | 15.3 |
| J Nat Gas Sci Eng 20 (2014) 347-356 | Li/MgO | 1073 | 2.0 | 1.0 | | 46.0 | 51.9 | | | 46.0 | 21.2 |
| J Nat Gas Sci Eng 18 (2014) 406-411 | La2O3-CeO2 | 843 | 5.0 | 1.0 | 97.0 | 25.0 | 42.0 | | | 58.0 | 14.5 |
| Kinetics and Catalysis 55 (2014) 361-371 | La-SiO2 | 973 | 3.8 | 1.0 | 22.3 | 4.0 | 98.1 | 0.1 | 1.8 | 1.9 | 0.1 |
| Kinetics and Catalysis 55 (2014) 361-371 | La-SiO2 | 1023 | 3.8 | 1.0 | 33.0 | 6.2 | 95.4 | 0.7 | 3.9 | 4.6 | 0.3 |
| Kinetics and Catalysis 55 (2014) 361-371 | La-SiO2 | 1073 | 3.8 | 1.0 | 45.4 | 8.9 | 90.0 | 3.4 | 6.6 | 10.0 | 0.9 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 973 | 3.8 | 1.0 | 21.8 | 4.3 | 97.8 | 0.1 | 2.1 | 2.2 | 0.1 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1023 | 3.8 | 1.0 | 32.5 | 6.5 | 94.9 | 0.8 | 4.3 | 5.1 | 0.3 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1073 | 3.8 | 1.0 | 45.0 | 9.3 | 88.6 | 4.2 | 7.2 | 11.4 | 1.1 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 973 | 3.8 | 1.0 | 44.0 | 8.2 | 89.1 | 1.4 | 9.5 | 10.9 | 0.9 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1023 | 3.8 | 1.0 | 69.9 | 13.4 | 84.8 | 4.0 | 11.2 | 15.2 | 2.0 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1073 | 3.8 | 1.0 | 84.5 | 16.7 | 82.1 | 6.8 | 11.1 | 17.9 | 3.0 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 973 | 3.8 | 1.0 | 35.0 | 7.4 | 95.5 | 0.5 | 4.0 | 4.5 | 0.3 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--|-----------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1023 | 3.8 | 1.0 | 53.9 | 11.2 | 90.9 | 2.1 | 7.0 | 9.1 | 1.0 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1073 | 3.8 | 1.0 | 71.2 | 14.6 | 86.0 | 4.9 | 9.1 | 14.0 | 2.0 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 973 | 3.8 | 1.0 | 35.4 | 6.8 | 97.4 | 0.2 | 2.4 | 2.6 | 0.2 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1023 | 3.8 | 1.0 | 60.5 | 11.5 | 94.9 | 1.1 | 4.0 | 5.1 | 0.6 |
| Kinetics and Catalysis 55 (2014) 361-371 | Al-La-SiO2 | 1073 | 3.8 | 1.0 | 78.3 | 14.7 | 91.0 | 3.1 | 5.9 | 9.0 | 1.3 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 973 | 2.0 | 1.0 | | 37.0 | 66.3 | | | 33.7 | 12.5 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 998 | 2.0 | 1.0 | | 38.7 | 66.7 | | | 33.3 | 12.9 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 1023 | 2.0 | 1.0 | | 41.3 | 63.8 | | | 36.2 | 14.9 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 1048 | 2.0 | 1.0 | | 39.0 | 59.1 | | | 40.9 | 16.0 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 1073 | 2.0 | 1.0 | | 38.1 | 64.8 | | | 35.2 | 13.4 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 1098 | 2.0 | 1.0 | | 40.9 | 80.1 | | | 19.9 | 8.1 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Li/MgO | 1123 | 2.0 | 1.0 | | 46.0 | 88.8 | | | 11.2 | 5.2 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 948 | 2.0 | 1.0 | | 11.1 | 92.5 | | | 7.5 | 0.8 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 973 | 2.0 | 1.0 | | 17.1 | 87.8 | | | 12.2 | 2.1 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 998 | 2.0 | 1.0 | | 23.7 | 87.0 | | | 13.0 | 3.1 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 1023 | 2.0 | 1.0 | | 35.4 | 75.7 | | | 24.3 | 8.6 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 1048 | 2.0 | 1.0 | | 36.2 | 71.9 | | | 28.1 | 10.2 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 1073 | 2.0 | 1.0 | | 36.5 | 70.5 | | | 29.6 | 10.8 |
| Reac Kinet Mech Cat 112 (2014) 227-240 | Ca-ZnO | 1098 | 2.0 | 1.0 | | 42.8 | 84.5 | | | 15.5 | 6.6 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/SiO2 | 1023 | 4.0 | 1.0 | | 30.6 | 28.7 | | | 71.3 | 21.8 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/SiO2 | 1073 | 4.0 | 1.0 | | 31.8 | 27.3 | | | 72.7 | 23.1 |
| Patent 26.03.2014: CN 103657640 A | K-W-Mn-Ba-Ti/SiO2 | 1093 | 5.0 | 1.0 | | 32.0 | 27.7 | | | 72.3 | 23.1 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/SiO2 | 1073 | 4.0 | 1.0 | | 30.0 | 28.8 | | | 71.2 | 21.4 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Ce-SiO2 | 1033 | 4.0 | 1.0 | | 32.5 | 26.6 | | | 73.4 | 23.9 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Ce-SiO2 | 1033 | 4.0 | 1.0 | | 32.0 | 27.5 | | | 72.5 | 23.2 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/La-SiO2 | 993 | 3.0 | 1.0 | | 33.0 | 39.9 | | | 60.1 | 19.8 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Sr-SiO2 | 993 | 3.0 | 1.0 | | 33.2 | 37.7 | | | 62.3 | 20.7 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Ru-SiO2 | 993 | 3.0 | 1.0 | | 32.5 | 33.5 | | | 66.5 | 21.6 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Rb-SiO2 | 993 | 3.0 | 1.0 | | 31.9 | 41.1 | | | 58.9 | 18.8 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Zr-SiO2 | 993 | 3.0 | 1.0 | | 31.5 | 39.8 | | | 60.2 | 19.0 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/Nd-SiO2 | 993 | 3.0 | 1.0 | | 32.3 | 38.8 | | | 61.2 | 19.8 |
| Patent 26.03.2014: CN 103657640 A | Na-W-Mn-Ba-Ti/SiO2 | 1073 | 4.0 | 1.0 | | 29.4 | 32.5 | | | 67.5 | 19.8 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 973 | | 1.0 | | 4.0 | 98.0 | | | 2.0 | 0.1 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1023 | | 1.0 | | 5.0 | 80.0 | | | 20.0 | 1.0 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1073 | | 1.0 | | 8.0 | 59.0 | | | 41.0 | 3.3 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1123 | | 1.0 | | 18.0 | 50.0 | | | 50.0 | 9.0 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1173 | | 1.0 | | 34.0 | 57.0 | | | 43.0 | 14.6 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 973 | | 1.0 | | 7.5 | 83.0 | | | 17.0 | 1.3 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1023 | | 1.0 | | 9.0 | 79.0 | | | 21.0 | 1.9 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1073 | | 1.0 | | 14.0 | 73.0 | | | 27.0 | 3.8 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1123 | | 1.0 | | 19.0 | 48.0 | | | 52.0 | 9.9 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1173 | | 1.0 | | 32.5 | 60.0 | | | 40.0 | 13.0 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 973 | | 1.0 | | 5.0 | 77.0 | | | 23.0 | 1.2 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--|---------------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1023 | | 1.0 | | 5.5 | 75.0 | | | 25.0 | 1.4 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1073 | | 1.0 | | 7.5 | 42.0 | | | 58.0 | 4.4 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1123 | | 1.0 | | 16.0 | 20.0 | | | 80.0 | 12.8 |
| J. Mem. Sci. 468. 2014. 31-41 | BiYSm/LSCF | 1173 | | 1.0 | | 22.0 | 32.0 | | | 68.0 | 15.0 |
| ACS Catal. 5 (2015) 1663 | LaCO3 | 713 | 3.0 | 1.0 | 97.2 | 30.0 | 51.0 | | | 49.0 | 14.7 |
| ACS Catal. 5 (2015) 1663 | LaCO3 | 713 | 3.0 | 1.0 | 0.8 | 0.3 | 100.0 | | | 0.0 | 0.0 |
| Appl Catal A 497(2015) 96-106 | Mn-Na2WO4/n-SiO2 | 1073 | 4.0 | 1.0 | | 25.2 | 27.8 | 44.9 | 27.0 | 73.3 | 18.5 |
| Appl Catal A 497(2015) 96-106 | Na2WO4/n-SiO2 | 1073 | 4.0 | 1.0 | | 4.2 | 31.8 | 21.8 | 46.4 | 69.0 | 2.9 |
| Appl Catal A 497(2015) 96-106 | Mn/n-SiO2 | 1073 | 4.0 | 1.0 | | 3.9 | 86.0 | 3.1 | 10.9 | 14.1 | 0.5 |
| Appl Catal A 497(2015) 96-106 | Mn-Na2WO4/n-MgO | 1073 | 4.0 | 1.0 | | 5.0 | 35.2 | 17.9 | 46.9 | 64.9 | 3.2 |
| Appl Catal A 504. 2015. 509-518 | La-Sr/CaO | 1023 | 4.0 | 1.0 | | 10.0 | 60.0 | | | 40.0 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/SiO2 | 1023 | 4.0 | 1.0 | | 10.0 | | | | 60-65 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/SiO2 | 1023 | 4.0 | 1.0 | | 10.0 | | | | 60-65 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/SiO2 | 1023 | 4.0 | 1.0 | | 10.0 | | | | 60-65 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/SiC | 1023 | 4.0 | 1.0 | | 10.0 | | | | 60-65 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/SiC | 1023 | 4.0 | 1.0 | | 10.0 | | | | 60-65 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/Al2O3 | 1023 | 4.0 | 1.0 | | 10.0 | | | | 6.0 | |
| Appl Catal A 504. 2015. 509-518 | Na-W-Mn/Al2O3 | 1023 | 4.0 | 1.0 | | 10.0 | | | | 60-65 | |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3 | 1073 | 4.0 | 1.0 | 100.0 | 17.7 | 51.5 | 36.1 | 12.4 | 48.5 | 8.6 |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3/p-Al2O3 | 1073 | 4.0 | 1.0 | 100.0 | 17.0 | 64.3 | 25.9 | 9.8 | 35.7 | 6.1 |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3/Al2O3 | 1073 | 4.0 | 1.0 | 100.0 | 13.7 | 70.7 | 22.1 | 7.2 | 29.3 | 4.0 |
| Catal Lett 145 (2015) 1251-1261 | Al2O3 Aerogel - NO3 | 1073 | 4.0 | 1.0 | 100.0 | 11.6 | 89.7 | 2.3 | 8.0 | 10.3 | 1.2 |
| Catal Lett 145 (2015) 1251-1261 | Al2O3 Aerogel - Cl | 1073 | 4.0 | 1.0 | 100.0 | 12.8 | 77.6 | 15.0 | 7.4 | 22.4 | 2.9 |
| Catal Lett 145 (2015) 1251-1261 | Al2O3 Xerogel - NO3 | 1073 | 4.0 | 1.0 | 100.0 | 14.1 | 81.2 | 13.6 | 5.2 | 18.8 | 2.7 |
| Catal Lett 145 (2015) 1251-1261 | Al2O3 Xerogel - Cl | 1073 | 4.0 | 1.0 | 100.0 | 13.3 | 80.8 | 13.2 | 6.0 | 19.2 | 2.6 |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3/Al2O3 Aerogel - NO3 | 1073 | 4.0 | 1.0 | 100.0 | 14.3 | 76.7 | 25.7 | -2.4 | 23.3 | 3.3 |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3/Al2O3 Aerogel - Cl | 1073 | 4.0 | 1.0 | 100.0 | 13.8 | 68.4 | 23.5 | 8.1 | 31.6 | 4.4 |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3/Al2O3 Xerogel - NO3 | 1073 | 4.0 | 1.0 | 100.0 | 12.6 | 73.5 | 18.8 | 7.7 | 26.5 | 3.3 |
| Catal Lett 145 (2015) 1251-1261 | Sm2O3/Al2O3 Xerogel - Cl | 1073 | 4.0 | 1.0 | 100.0 | 19.3 | 57.1 | 32.1 | 10.8 | 42.9 | 8.3 |
| Chem. Eng. J. 281, 2015, 678-687 | Na2WO4/Mn/SiO2 | 1103 | 2.0 | 1.0 | | 47.0 | 50.0 | | | 41.0 | 19.3 |
| Chem. Eng. J. 281, 2015, 678-687 | Na2WO4/Mn/SiO2 | 1103 | 2.0 | 1.0 | | 49.0 | 46.0 | | | 48.0 | 23.5 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1223 | 7.0 | 1.0 | 98.9 | 28.0 | 50.0 | | | 45.2 | 12.7 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1233 | 7.0 | 1.0 | 98.6 | 27.8 | 41.1 | | | 54.0 | 15.0 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1248 | 7.0 | 1.0 | 96.2 | 24.1 | 37.0 | | | 59.6 | 14.4 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1293 | 7.0 | 1.0 | 94.0 | 21.4 | 30.5 | | | 63.0 | 13.5 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1293 | 7.0 | 1.0 | 91.6 | 20.4 | 27.8 | | | 66.5 | 13.6 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1298 | 7.0 | 1.0 | 89.1 | 19.3 | 25.7 | | | 69.5 | 13.4 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1183 | 7.0 | 1.0 | 60.1 | 16.0 | 23.8 | | | 71.8 | 11.5 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1008 | 7.0 | 1.0 | 92.1 | 17.6 | 34.5 | | | 65.5 | 11.5 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1098 | 7.0 | 1.0 | 84.9 | 16.7 | 32.8 | | | 67.2 | 11.2 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1193 | 4.0 | 1.0 | 97.1 | 15.5 | 51.3 | | | 48.7 | 7.5 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1273 | 4.0 | 1.0 | 89.8 | 15.3 | 49.0 | | | 51.0 | 7.8 |
| Chem. Eng. Technol. 38, 2015, No.12, 2243-2252 | La/MgO | 1163 | 4.0 | 1.0 | 94.5 | 14.8 | 51.8 | | | 48.2 | 7.1 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---------------------------------------|---------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Fuel Proc Techn 133 (2015) 29-34 | NaCl-Mn-Na2WO4/SiO2 | 1023 | 1.6 | 1.0 | 80.7 | 55.0 | 37.1 | 56.8 | 4.4 | 61.2 | 33.7 |
| Fuel Proc Techn 133 (2015) 29-34 | KCl-Mn-Na2WO4/SiO2 | 1023 | 1.6 | 1.0 | 45.5 | 35.9 | 24.7 | 61.2 | 11.2 | 72.4 | 26.0 |
| Fuel Proc Techn 133 (2015) 29-34 | CsCl-Mn-Na2WO4/SiO2 | 1023 | 1.6 | 1.0 | 37.3 | 30.1 | 25.1 | 58.1 | 13.9 | 72.0 | 21.7 |
| Fuel Proc Techn 133 (2015) 29-34 | LiCl-Mn-Na2WO4/SiO2 | 1023 | 1.6 | 1.0 | 14.1 | 14.1 | 19.8 | 45.3 | 33.7 | 79.0 | 11.1 |
| Fuel Proc Techn 133 (2015) 29-34 | Mn/Na2WO4/SiO2 | 1023 | 1.6 | 1.0 | 8.2 | 8.2 | 36.6 | 20.4 | 43.0 | 63.4 | 5.2 |
| Fuel Proc Techn 133 (2015) 29-34 | NaCl-Mn/SiO2 | 1023 | 1.6 | 1.0 | 52.2 | 52.2 | 41.6 | 52.3 | 4.6 | 56.9 | 29.7 |
| Fuel Proc Techn 133 (2015) 29-34 | Mn/SiO2 | 1023 | 1.6 | 1.0 | 18.3 | 18.3 | 91.7 | 3.4 | 4.8 | 8.2 | 1.5 |
| J. Catal. 329, 2015, 560-573 | MgO | 1023 | 3.0 | 1.0 | 5.0 | 2.0 | 95.0 | 0.0 | 5.0 | 5.0 | 0.1 |
| J. Catal. 329, 2015, 560-573 | MgO | 1023 | 3.0 | 1.0 | 75.0 | 23.0 | 72.0 | 11.7 | 16.3 | 28.0 | 6.4 |
| J. Catal. 329, 2015, 560-573 | MgO | 1023 | 3.0 | 1.0 | 87.0 | 26.0 | 70.0 | 15.1 | 14.9 | 30.0 | 7.8 |
| J. Catal. 329, 2015, 560-573 | MgO | 1023 | 3.0 | 1.0 | 27.0 | 8.0 | 95.0 | 0.8 | 4.2 | 5.0 | 0.4 |
| J. Catal. 329, 2015, 560-573 | MgO | 1023 | 3.0 | 1.0 | 98.0 | 30.0 | 59.0 | 24.1 | 16.9 | 41.0 | 12.3 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 973 | | 1.0 | | 15.0 | 26.0 | | | 74.0 | 11.1 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1023 | | 1.0 | | 16.0 | 22.0 | | | 78.0 | 12.5 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1073 | | 1.0 | | 20.0 | 20.0 | | | 80.0 | 16.0 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1123 | | 1.0 | | 28.0 | 11.0 | | | 89.0 | 24.9 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1173 | | 1.0 | | 39.0 | 17.0 | | | 83.0 | 32.4 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 973 | | 1.0 | | 22.0 | 59.0 | | | 41.0 | 9.0 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1023 | | 1.0 | | 22.5 | 49.5 | | | 50.5 | 11.4 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1073 | | 1.0 | | 30.0 | 40.0 | | | 60.0 | 18.0 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1123 | | 1.0 | | 47.0 | 39.0 | | | 61.0 | 28.7 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1173 | | 1.0 | | 58.0 | 40.0 | | | 60.0 | 34.8 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 973 | | 1.0 | | 15.0 | 50.0 | | | 50.0 | 7.5 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1023 | | 1.0 | | 18.0 | 40.0 | | | 60.0 | 10.8 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1073 | | 1.0 | | 26.0 | 31.0 | | | 69.0 | 17.9 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1123 | | 1.0 | | 41.0 | 28.0 | | | 72.0 | 29.5 |
| J. Mem. Sci. 488. 2015. 182-193 | BiYSm/LSCF | 1173 | | 1.0 | | 49.0 | 21.0 | | | 79.0 | 38.7 |
| Nanoscale 7 (2015) 2260-2264 | SrO | 973 | 3.0 | 1.0 | | 37.0 | 48.6 | | | 51.4 | 19.0 |
| Nanoscale 7 (2015) 2260-2264 | Ba-La2O3 | 973 | 3.0 | 1.0 | | 34.0 | 52.9 | | | 47.1 | 16.0 |
| Nanoscale 7 (2015) 2260-2264 | Ca-La2O3 | 973 | 3.0 | 1.0 | | 33.5 | 51.6 | | | 48.4 | 16.2 |
| Nanoscale 7 (2015) 2260-2264 | K-La2O3 | 973 | 3.0 | 1.0 | | 32.0 | 53.1 | | | 46.9 | 15.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1137 | 2.2 | 1.0 | 94.0 | 43.0 | 55.0 | 33.0 | 6.0 | 39.0 | 16.8 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1156 | 1.9 | 1.0 | 93.0 | 43.0 | 54.0 | 35.0 | 5.0 | 40.0 | 17.2 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1178 | 2.0 | 1.0 | 94.0 | 43.0 | 57.0 | 33.0 | 3.0 | 36.0 | 15.5 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1194 | 1.6 | 1.0 | 96.0 | 43.0 | 60.0 | 31.0 | 2.0 | 33.0 | 14.2 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1152 | 2.1 | 1.0 | 86.0 | 38.0 | 60.0 | 30.0 | 5.0 | 35.0 | 13.3 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1172 | 1.9 | 1.0 | 90.0 | 40.0 | 61.0 | 29.0 | 4.0 | 33.0 | 13.2 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1186 | 2.4 | 1.0 | 89.0 | 41.0 | 63.0 | 27.0 | 3.0 | 30.0 | 12.3 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1194 | 1.9 | 1.0 | 93.0 | 39.0 | 63.0 | 27.0 | 3.0 | 30.0 | 11.7 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1152 | 2.0 | 1.0 | 43.0 | 18.0 | 60.0 | 24.0 | 13.0 | 37.0 | 6.7 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1167 | 1.9 | 1.0 | 53.0 | 23.0 | 62.0 | 25.0 | 9.0 | 34.0 | 7.8 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1183 | 2.0 | 1.0 | 64.0 | 29.0 | 67.0 | 23.0 | 6.0 | 29.0 | 8.4 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1199 | 2.1 | 1.0 | 75.0 | 34.0 | 72.0 | 22.0 | 5.0 | 27.0 | 9.2 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|---|----------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1159 | 2.0 | 1.0 | 99.0 | 39.0 | 58.0 | 34.0 | 4.0 | 38.0 | 14.8 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1174 | 2.0 | 1.0 | 99.0 | 41.0 | 60.0 | 32.0 | 3.0 | 35.0 | 14.4 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1185 | 2.0 | 1.0 | 100.0 | 42.0 | 61.0 | 31.0 | 2.0 | 33.0 | 13.9 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1193 | 1.9 | 1.0 | 100.0 | 43.0 | 62.0 | 30.0 | 2.0 | 32.0 | 13.8 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1143 | 2.0 | 1.0 | 74.0 | 25.0 | 45.0 | 37.0 | 11.0 | 48.0 | 12.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1162 | 2.0 | 1.0 | 84.0 | 44.0 | 52.0 | 34.0 | 7.0 | 41.0 | 18.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1184 | 2.0 | 1.0 | 90.0 | 40.0 | 64.0 | 26.0 | 3.0 | 29.0 | 11.6 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1197 | 1.9 | 1.0 | 95.0 | 43.0 | 63.0 | 24.0 | 4.0 | 28.0 | 12.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1133 | 1.8 | 1.0 | 77.0 | 32.0 | 57.0 | 32.0 | 7.0 | 39.0 | 12.5 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1157 | 2.1 | 1.0 | 85.0 | 37.0 | 59.0 | 31.0 | 5.0 | 36.0 | 13.3 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1174 | 2.0 | 1.0 | 91.0 | 39.0 | 61.0 | 30.0 | 3.0 | 33.0 | 12.9 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1185 | 2.1 | 1.0 | 93.0 | 42.0 | 61.0 | 29.0 | 3.0 | 32.0 | 13.4 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1133 | 1.8 | 1.0 | 98.0 | 42.0 | 59.0 | 30.0 | 7.0 | 37.0 | 15.5 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1157 | 1.7 | 1.0 | 98.0 | 43.0 | 58.0 | 32.0 | 4.0 | 36.0 | 15.5 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1172 | 1.8 | 1.0 | 98.0 | 47.0 | 56.0 | 29.0 | 8.0 | 37.0 | 17.4 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1192 | 1.7 | 1.0 | 98.0 | 44.0 | 58.0 | 31.0 | 3.0 | 34.0 | 15.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1135 | 1.9 | 1.0 | 82.0 | 34.0 | 58.0 | 32.0 | 6.0 | 38.0 | 12.9 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1154 | 2.0 | 1.0 | 89.0 | 39.0 | 58.0 | 31.0 | 4.0 | 35.0 | 13.7 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1175 | 2.1 | 1.0 | 95.0 | 43.0 | 59.0 | 30.0 | 5.0 | 35.0 | 15.1 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1194 | 1.9 | 1.0 | 98.0 | 43.0 | 61.0 | 27.0 | 3.0 | 30.0 | 12.9 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1153 | 2.0 | 1.0 | 83.0 | 36.0 | 60.0 | 31.0 | 5.0 | 36.0 | 13.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1169 | 2.0 | 1.0 | 84.0 | 38.0 | 60.0 | 29.0 | 5.0 | 34.0 | 12.9 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1181 | 2.2 | 1.0 | 85.0 | 39.0 | 62.0 | 28.0 | 3.0 | 31.0 | 12.1 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1191 | 2.0 | 1.0 | 89.0 | 40.0 | 64.0 | 26.0 | 4.0 | 30.0 | 12.0 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1151 | 2.0 | 1.0 | 79.0 | 33.0 | 65.0 | 27.0 | 5.0 | 32.0 | 10.6 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1174 | 1.8 | 1.0 | 91.0 | 39.0 | 71.0 | 22.0 | 2.0 | 24.0 | 9.4 |
| Petroleum Chemistry 55 (2015) 163-168 | Li-W-Mn/SiO2 | 1193 | 1.9 | 1.0 | 96.0 | 41.0 | 74.0 | 18.0 | 1.0 | 19.0 | 7.8 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 5.1 | 86.0 | | | 14.0 | 0.7 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 6.4 | 90.0 | | | 10.0 | 0.6 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 6.3 | 91.0 | | | 9.0 | 0.6 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 3.3 | 72.5 | | | 27.5 | 0.9 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 1.8 | 60.0 | | | 40.0 | 0.7 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 2.3 | 42.0 | | | 58.0 | 1.3 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 4.5 | 51.0 | | | 49.0 | 2.2 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 3.0 | 52.5 | | | 47.5 | 1.4 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 3.5 | 46.0 | | | 54.0 | 1.9 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 2.8 | 41.0 | | | 59.0 | 1.7 |
| Appl. Catal. A 524, 2016, 192-199 | Fe-Al-Si-Ca-O | 1023 | 9.9 | 1.0 | | 2.5 | 43.0 | | | 57.0 | 1.4 |
| App. Catal. A: General 525. 2016. 168-179 | Na2WO4/Mn/SiO2 | 1023 | 4.0 | 1.0 | | 6.7 | 47.1 | | | 52.9 | 3.6 |
| App. Catal. A: General 525. 2016. 168-179 | Na2WO4/Mn/SiO2 | 1023 | 4.0 | 1.0 | | 2.0 | 36.4 | | | 63.6 | 1.3 |
| App. Catal. A: General 525. 2016. 168-179 | Na2WO4/Mn/SiO2 | 1023 | 4.0 | 1.0 | | 7.4 | 38.7 | | | 61.3 | 4.5 |
| App. Catal. A: General 525. 2016. 168-179 | Na2WO4/Mn/SiO2 | 1023 | 4.0 | 1.0 | | 7.3 | 39.3 | | | 60.7 | 4.5 |
| App. Catal. A: General 525. 2016. 168-179 | Na2WO4/Mn/SiO2 | 1023 | 4.0 | 1.0 | | 7.1 | 31.1 | | | 68.9 | 4.9 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | p(CH ₄)/p(O ₂) | p _{total} , bar | X(O ₂), % | X(CH ₄), % | S(CO _x), % | S(C ₂ ⁻), % | S(C ₂ -), % | S(C ₂), % | Y(C ₂), % |
|--|--|----------|--|--------------------------|-----------------------|------------------------|------------------------|------------------------------------|------------------------|-----------------------|-----------------------|
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 6.4 | 44.6 | | | 55.4 | 3.5 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 6.6 | 37.4 | | | 62.6 | 4.2 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 5.9 | 42.6 | | | 57.4 | 3.3 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 4.4 | 19.7 | | | 80.3 | 3.5 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 7.0 | 24.2 | | | 75.8 | 5.4 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 14.1 | 26.6 | | | 73.4 | 10.4 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 998 | 4.0 | 1.0 | | 8.2 | 63.7 | | | 36.3 | 3.0 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 998 | 4.0 | 1.0 | | 5.0 | 76.6 | | | 23.4 | 1.2 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 998 | 4.0 | 1.0 | | 0.7 | 70.0 | | | 30.0 | 0.2 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 16.5 | 48.6 | | | 51.4 | 8.5 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 10.1 | 58.2 | | | 41.8 | 4.2 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | 4.0 | 1.0 | | 1.5 | 50.4 | | | 49.6 | 0.7 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 25.2 | 40.6 | | | 59.4 | 15.0 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 17.9 | 45.2 | | | 54.8 | 9.8 |
| App. Catal. A: General 525. 2016. 168-179 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 3.5 | 31.2 | | | 68.8 | 2.4 |
| Appl. Catal. B. 199, 2016, 252-259 | Sr/La ₂ O ₃ | 1023 | 4.0 | 1.9 | | 7.0 | 76.6 | | | 23.4 | 1.6 |
| Appl. Catal. B. 199, 2016, 252-259 | La-Sr/CaO | 1020 | 4.0 | 1.9 | | 3.2 | 73.3 | | | 26.7 | 0.9 |
| Appl. Catal. B. 199, 2016, 252-259 | Na ₂ WO ₄ /Mn/SiO ₂ | 1021 | 4.0 | 1.2 | | 2.1 | 47.5 | | | 52.5 | 1.1 |
| Appl. Catal. B. 199, 2016, 252-259 | Li/MgO | 1023 | 4.0 | 1.1 | | 0.9 | 51.0 | | | 49.0 | 0.4 |
| Appl. Catal. B. 199, 2016, 252-259 | Sn-Li/MgO | 1023 | 3.5 | 1.2 | | 12.4 | 41.9 | | | 58.1 | 7.2 |
| Catal. Commun. 85, 2016, 75-78 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 24.0 | 39.5 | 33.5 | 27.0 | 60.5 | 14.5 |
| Catal. Commun. 85, 2016, 75-78 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 9.2 | 27.0 | 28.0 | 45.0 | 73.0 | 6.7 |
| Catal. Commun. 85, 2016, 75-78 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 10.9 | 25.9 | 26.2 | 47.9 | 74.1 | 8.1 |
| Catal. Commun. 85, 2016, 75-78 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | 4.0 | 1.0 | | 7.2 | 24.5 | 27.6 | 47.9 | 75.5 | 5.4 |
| Chem. Eng. J. 306, 2016, 646-654 | Na ₂ WO ₄ /Mn/SiO ₂ | 1073 | 3.0 | 1.0 | 100.0 | 29.0 | 37.0 | | | 63.0 | 18.3 |
| Chem. Eng. J. 306, 2016, 646-654 | Na ₂ WO ₄ /Mn/SiO ₂ | 1073 | 3.0 | 1.0 | 100.0 | 18.0 | 19.0 | | | 81.0 | 14.6 |
| Chem. Eng. J. 306, 2016, 646-654 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | | 1.0 | | 29.0 | 26.0 | | | 74.0 | 21.5 |
| Chem. Eng. J. 306, 2016, 646-654 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | | 1.0 | | 18.0 | 11.0 | | | 89.0 | 16.0 |
| Chem. Eng. J. 306, 2016, 646-654 | Na ₂ WO ₄ /Mn/SiO ₂ | 1048 | | 1.0 | | 21.0 | 13.0 | | | 87.0 | 18.3 |
| Chem. Eng. J. 306, 2016, 646-654 | Na ₂ WO ₄ /Mn/SiO ₂ | 1023 | | 1.0 | | 19.0 | 13.0 | | | 87.0 | 16.5 |
| Fuel 167, 2016, 208-217 | Ca-PO ₄ -OH | 973 | 2.7 | 1.0 | | 26.0 | 79.0 | | | 21.0 | 5.5 |
| Fuel 167, 2016, 208-217 | Ca-CO ₃ -OH | 973 | 2.7 | 1.0 | | 5.5 | 91.0 | | | 9.0 | 0.5 |
| Fuel 167, 2016, 208-217 | Pb-Ca-CO ₃ -OH | 973 | 2.7 | 1.0 | | 26.0 | 66.0 | | | 34.0 | 8.8 |
| Fuel 167, 2016, 208-217 | Pb-Ca-PO ₄ -OH | 973 | 2.7 | 1.0 | | 22.5 | 43.0 | | | 57.0 | 12.8 |
| Fuel Proc Tech 151. 2016. 148-154 | Na-W-Mn-Cl/SiO ₂ | 1023 | 1.6 | 1.0 | | 48.0 | 33.0 | | | 67.0 | 32.0 |
| Fuel Proc Tech 151. 2016. 148-154 | Na-W-Mn-Cl/SiO ₂ | 973 | 1.6 | 1.0 | | 24.0 | 25.0 | | | 75.0 | 18.0 |
| RSC Adv 6. 2016. 34872 | La ₂ O ₃ | 823 | 3.0 | 1.0 | | 9.9 | 93.6 | | | 6.4 | 0.6 |
| RSC Adv 6. 2016. 34872 | La ₂ O ₃ | 823 | 3.0 | 1.0 | | 29.0 | 59.5 | | | 40.5 | 11.7 |
| RSC Adv 6. 2016. 34872 | La ₂ O ₃ | 823 | 3.0 | 1.0 | | 32.3 | 54.1 | | | 45.9 | 14.8 |
| RSC Adv 6. 2016. 34872 | La ₂ O ₃ | 823 | 3.0 | 1.0 | | 28.9 | 58.4 | | | 41.6 | 12.0 |
| Sci. Rep. 6. 25154; DOI: 10.1038/srep25154(2016) | TBA-P-W/CeO ₂ | 689 | 1.7 | 1.0 | 20.6 | 14.9 | | | | 43.4 | 6.5 |
| Sci. Rep. 6. 25154; DOI: 10.1038/srep25154(2016) | Ce-W/CeO ₂ | 649 | 1.7 | 1.0 | 18.5 | 13.6 | | | | 39.0 | 5.3 |
| Sci. Rep. 6. 25154; DOI: 10.1038/srep25154(2016) | WO ₃ /CeO ₂ | 634 | 1.7 | 1.0 | 20.8 | 14.3 | | | | 32.4 | 4.6 |

Table S1: Database with catalyst composition and their performance in OCM reaction under different conditions.

| Reference | Catalyst | Temp., K | $p(\text{CH}_4)/p(\text{O}_2)$ | p_{total} , bar | $X(\text{O}_2)$, % | $X(\text{CH}_4)$, % | $S(\text{CO}_x)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2^-)$, % | $S(\text{C}_2)$, % | $Y(\text{C}_2)$, % |
|--|-----------------------------------|----------|--------------------------------|--------------------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|
| Sci. Rep. 6. 25154; DOI: 10.1038/srep25154(2016) | CeO ₂ -WO ₃ | 659 | 1.7 | 1.0 | 11.6 | 9.7 | | | | 41.2 | 4.0 |
| Sci. Rep. 6. 25154; DOI: 10.1038/srep25154(2016) | WO ₃ | 484 | 1.7 | 1.0 | 2.5 | 0.0 | | | | 0.0 | 0.0 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|----------------------------------|---------|-------|-------|----------------|---|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | CaO/SiO ₂ | | 6.32E-02 | | | 2.31E-03 | | 5.75E-04 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | MgO/SiO ₂ | | 3.09E-01 | | | 5.38E-03 | | 6.55E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | La ₂ O ₃ /SiO ₂ | | 7.02E-02 | | | 5.00E-03 | | 1.38E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | Y ₂ O ₃ /SiO ₂ | | 0.00E+00 | | | 8.85E-03 | | 0.00E+00 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | Al ₂ O ₃ /SiO ₂ | | 1.54E-01 | | | 1.37E-02 | | 8.31E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | Ga ₂ O ₃ /SiO ₂ | | 7.02E-03 | | | 3.44E-02 | | 9.52E-04 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | Bi ₂ O ₃ /SiO ₂ | | 1.75E-01 | | | 2.67E-02 | | 1.85E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | ZrO ₂ /SiO ₂ | | 7.02E-03 | | | 1.13E-02 | | 3.14E-04 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | Sb ₂ O ₃ /SiO ₂ | | 5.65E-01 | | | 5.00E-03 | | 1.11E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | As ₂ O ₃ /SiO ₂ | | 4.35E-01 | | | 8.85E-03 | | 1.52E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /SiO ₂ | | 6.53E-01 | | | 4.23E-03 | | 1.09E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | Nb ₂ O ₅ /SiO ₂ | | 4.74E-01 | | | 8.27E-03 | | 1.54E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | WO ₃ /SiO ₂ | | 5.75E-01 | | | 5.38E-03 | | 1.22E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | P ₂ O ₅ /SiO ₂ | | 6.32E-01 | | | 1.73E-03 | | 4.31E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Ba ₂ O ₃ /SiO ₂ | | 1.24E-01 | | | 9.76E-04 | | 4.78E-04 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /CaO/SiO ₂ | | 7.91E-01 | | | 2.68E-03 | | 8.36E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /MgO/SiO ₂ | | 2.48E-01 | | | 2.59E-02 | | 2.53E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /La ₂ O ₃ /SiO ₂ | | 6.71E-01 | | | 2.44E-03 | | 6.45E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /CeO ₂ /SiO ₂ | | 2.66E-02 | | | 6.83E-03 | | 7.17E-04 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Pr ₂ O ₃ /SiO ₂ | | 5.38E-01 | | | 4.39E-03 | | 9.32E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Sm ₂ O ₃ /SiO ₂ | | 7.21E-01 | | | 2.44E-03 | | 6.93E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Y ₂ O ₃ /SiO ₂ | | 4.04E-01 | | | 1.95E-03 | | 3.11E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Al ₂ O ₃ /SiO ₂ | | 4.66E-01 | | | 3.90E-03 | | 7.17E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /SnO ₂ /SiO ₂ | | 1.40E-02 | | | 3.02E-02 | | 1.67E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Bi ₂ O ₃ /SiO ₂ | | 2.98E-01 | | | 1.22E-03 | | 1.43E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /ZrO ₂ /SiO ₂ | | 9.94E-01 | | | 4.88E-04 | | 1.91E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 923 | gas | O ₂ | B ₂ O ₃ /Fe ₂ O ₃ /SiO ₂ | | 8.54E-03 | | | 3.90E-02 | | 1.31E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 873 | gas | O ₂ | B ₂ O ₃ /Cab-O-Sil | | 7.90E-01 | | | 2.13E-03 | | 2.02E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 873 | gas | O ₂ | B ₂ O ₃ /BeO/Cab-O-Sil | | 3.47E-01 | | | 2.74E-02 | | 1.14E-02 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 873 | gas | O ₂ | B ₂ O ₃ /MgO/Cab-O-Sil | | 2.25E-01 | | | 3.48E-02 | | 9.37E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 873 | gas | O ₂ | B ₂ O ₃ /CaO/Cab-O-Sil | | 4.40E-01 | | | 6.71E-03 | | 3.53E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 873 | gas | O ₂ | B ₂ O ₃ /SrO/Cab-O-Sil | | 4.94E-01 | | | 1.83E-03 | | 1.08E-03 |
| J. Catal. 1987. 108(1): 252-255. | FBR | 873 | gas | O ₂ | B ₂ O ₃ /BaO/Cab-O-Sil | | 4.94E-01 | | | 1.22E-03 | | 7.20E-04 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | SiO ₂ | | 1.00E+00 | | | 2.00E-05 | | 3.05E-03 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | | 6.00E-01 | 2.50E-01 | 1.50E-01 | 4.70E-03 | | 4.31E-01 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | | 1.60E-01 | 2.60E-01 | 5.80E-01 | 5.50E-03 | | 1.34E-01 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | | 2.00E-02 | 2.30E-01 | 7.50E-01 | 1.75E-02 | | 5.35E-02 |
| Catal. Today 32 (1996) 171-175 | FBR | 723 | gas | O ₂ | α-Fe ₂ O ₃ | | | | 1.00E+00 | 2.10E-03 | | 0.00E+00 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | WO ₃ | | 1.00E+00 | 0.00E+00 | 0.00E+00 | 6.00E-05 | | 4.58E-03 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | SnO ₂ /WO ₃ | | 9.30E-01 | 7.00E-02 | 0.00E+00 | 1.10E-03 | | 7.81E-02 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|----------------------------------|---------|-------|-------|----------------|---|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | SnO _x /WO ₃ | | 6.60E-01 | 3.10E-01 | 3.00E-02 | 2.60E-03 | | 1.31E-01 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | SnO ₂ | | | 9.00E-02 | 9.10E-01 | 2.80E-02 | | 0.00E+00 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | WO _x /SnO ₂ | | 4.00E-02 | 2.00E-01 | 7.60E-01 | 1.50E-02 | | 4.58E-02 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | WO _x /SnO ₃ | | 5.10E-01 | 4.60E-01 | 3.00E-02 | 3.00E-03 | | 1.17E-01 |
| Catal. Today 32 (1996) 171-175 | FBR | 873 | gas | O ₂ | WO _x /SnO ₄ | | 5.10E-01 | 4.60E-01 | 3.00E-02 | 3.00E-03 | | 1.17E-01 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | Blank | | | 8.80E-02 | 9.12E-01 | 1.80E-02 | | 0.00E+00 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | HZSM-5 | | | 6.67E-01 | 3.33E-01 | 1.14E-01 | | 0.00E+00 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | NaZSM-5 | | | 3.80E-02 | 9.62E-01 | 4.10E-02 | | 0.00E+00 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 2.90E-02 | 3.47E-01 | 6.24E-01 | 8.40E-02 | | 8.31E-03 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 3.50E-02 | 2.50E-01 | 7.16E-01 | 9.80E-02 | | 1.17E-02 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 5.20E-02 | 3.51E-01 | 5.96E-01 | 9.40E-02 | | 1.67E-02 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 4.60E-02 | 4.13E-01 | 5.41E-01 | 1.10E-01 | | 1.73E-02 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 4.90E-02 | 4.10E-01 | 5.41E-01 | 1.13E-01 | | 1.89E-02 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 4.80E-02 | 4.72E-01 | 4.80E-01 | 1.10E-01 | | 1.80E-02 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /HZSM-5 | | 4.10E-02 | 4.60E-01 | 5.00E-01 | 1.19E-01 | | 1.66E-02 |
| Appl. Catal.A 172 (1998) 165-176 | FBR | 923 | gas | O ₂ | WO _x /NaZSM-5 | | 1.40E-02 | 4.52E-01 | 5.34E-01 | 4.60E-02 | | 2.20E-03 |
| J. Catal. 190, 118–127 (2000) | FBR | 773 | gas | O ₂ | MoO _x /SiO ₂ | 2.00E-02 | 3.20E-01 | 2.50E-01 | 4.10E-01 | 5.80E-03 | 1.99E-04 | 2.98E-03 |
| J. Catal. 190, 118–127 (2000) | FBR | 823 | gas | O ₂ | MoO _x /SiO ₂ | 1.00E-02 | 1.30E-01 | 3.50E-01 | 5.10E-01 | 1.20E-02 | 2.06E-04 | 2.51E-03 |
| J. Catal. 190, 118–127 (2000) | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | 1.00E-02 | 1.20E-01 | 3.30E-01 | 5.40E-01 | 4.00E-02 | 6.86E-04 | 7.72E-03 |
| J. Catal. 190, 118–127 (2000) | FBR | 923 | gas | O ₂ | MoO _x /SiO ₂ | | 1.00E-02 | 1.80E-01 | 8.10E-01 | 6.60E-02 | | 1.06E-03 |
| J. Catal. 190, 118–127 (2000) | FBR | 773 | gas | O ₂ | MoO _x /SiO ₂ | 1.30E-01 | 7.30E-01 | 0.00E+00 | 1.40E-01 | 1.00E-02 | 2.23E-03 | 1.17E-02 |
| J. Catal. 190, 118–127 (2000) | FBR | 823 | gas | O ₂ | MoO _x /SiO ₂ | 8.00E-02 | 5.20E-01 | 1.00E-01 | 3.00E-01 | 2.90E-02 | 3.98E-03 | 2.42E-02 |
| J. Catal. 190, 118–127 (2000) | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | 1.10E-01 | 3.50E-01 | 1.70E-01 | 3.70E-01 | 8.20E-02 | 1.55E-02 | 4.61E-02 |
| J. Catal. 190, 118–127 (2000) | FBR | 873 | gas | O ₂ | H ₄ SiMo ₁₂ O ₄₀ /SiO ₂ | 4.51E-02 | 8.56E-01 | 4.78E-02 | 5.07E-02 | 2.52E-01 | 1.30E-02 | 2.31E-01 |
| Catal. Today 55 (2000) 269–280 | FBR | 773 | gas | O ₂ | FePO ₄ /Al ₂ O ₃ | | 1.00E-02 | 4.40E-01 | 5.50E-01 | 4.10E-02 | | 1.70E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 773 | gas | O ₂ | FePO ₄ /Al ₂ O ₃ | | 1.00E-02 | 4.10E-01 | 5.80E-01 | 4.60E-02 | | 1.91E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 773 | gas | O ₂ | FePO ₄ /Al ₂ O ₃ | | 1.00E-02 | 4.60E-01 | 5.30E-01 | 3.90E-02 | | 1.62E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /ZrO ₂ | | 1.10E-01 | 6.00E-01 | 2.90E-01 | 3.40E-02 | | 1.55E-01 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /ZrO ₂ | | 7.00E-02 | 5.50E-01 | 3.70E-01 | 3.90E-02 | | 1.13E-01 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /ZrO ₂ | | 6.00E-02 | 5.30E-01 | 3.80E-01 | 3.60E-02 | | 8.95E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /TiO ₂ | | 4.00E-02 | 6.20E-01 | 3.40E-01 | 4.40E-02 | | 7.29E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /TiO ₂ | | 3.00E-02 | 5.80E-01 | 3.90E-01 | 4.80E-02 | | 5.97E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /TiO ₂ | | 2.00E-02 | 5.40E-01 | 4.40E-01 | 3.80E-02 | | 3.15E-02 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /SiO ₂ | 2.00E-02 | 8.80E-01 | 9.00E-02 | 1.00E-02 | 1.60E-02 | 1.41E-02 | 5.84E-01 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /SiO ₂ | 1.00E-02 | 6.90E-01 | 2.50E-01 | 5.00E-02 | 1.70E-02 | 7.52E-03 | 4.86E-01 |
| Catal. Today 55 (2000) 269–280 | FBR | 873 | gas | O ₂ | FePO ₄ /SiO ₂ | | 3.40E-01 | 5.40E-01 | 1.20E-01 | 2.10E-02 | | 2.96E-01 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | HZSM-5 | | 0.00E+00 | 6.42E-01 | 3.58E-01 | 9.90E-02 | | 0.00E+00 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 4.60E-02 | 6.43E-01 | 3.11E-01 | 7.90E-02 | | 1.24E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 4.50E-02 | 6.47E-01 | 3.08E-01 | 9.50E-02 | | 1.46E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 3.40E-02 | 6.66E-01 | 3.00E-01 | 1.31E-01 | | 1.52E-02 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|----------------------------------|---------|-------|-------|----------------|------------------------------------|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 3.30E-02 | 6.08E-01 | 3.59E-01 | 1.11E-01 | | 1.25E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 3.50E-02 | 5.42E-01 | 4.23E-01 | 1.06E-01 | | 1.26E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 1.40E-02 | 7.75E-01 | 2.11E-01 | 7.90E-02 | | 3.77E-03 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 2.60E-02 | 7.15E-01 | 2.69E-01 | 6.20E-02 | | 5.50E-03 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 1.04E-01 | 5.93E-01 | 3.03E-01 | 5.80E-02 | | 2.06E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 1.06E-01 | 5.69E-01 | 3.25E-01 | 6.50E-02 | | 2.35E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 9.30E-02 | 5.27E-01 | 3.80E-01 | 6.30E-02 | | 2.00E-02 |
| Appl. Catal.A 203 (2000) 81–90 | FBR | 873 | gas | O ₂ | Mo/ZSM-5 | | 8.90E-02 | 5.11E-01 | 4.00E-01 | 6.50E-02 | | 1.97E-02 |
| Appl. Catal.A 193 (2000) 139–146 | FBR | 923 | gas | O ₂ | MoO _x /HZSM-5 | 0.00E+00 | 1.48E-01 | 5.51E-01 | 3.01E-01 | 1.21E-01 | | 6.11E-02 |
| J. Catal. 191, 384–400 (2000) | FBR | 868 | gas | O ₂ | VO _x /MCM-41 | 7.00E-03 | 2.84E-01 | | | 3.00E-02 | 2.87E-02 | 1.09E+00 |
| J. Catal. 191, 384–400 (2000) | FBR | 897 | gas | O ₂ | VO _x /MCM-41 | 4.00E-03 | 1.72E-01 | | | 6.60E-02 | 3.61E-02 | 1.46E+00 |
| J. Catal. 191, 384–400 (2000) | FBR | 924 | gas | O ₂ | VO _x /MCM-41 | 3.00E-03 | 1.23E-01 | | | 9.30E-02 | 3.82E-02 | 1.47E+00 |
| J. Catal. 191, 384–400 (2000) | FBR | 868 | gas | O ₂ | VO _x /MCM-41 | 6.00E-03 | 2.91E-01 | | | 3.20E-02 | 2.63E-02 | 1.19E+00 |
| J. Catal. 191, 384–400 (2000) | FBR | 899 | gas | O ₂ | VO _x /MCM-41 | 2.00E-03 | 2.20E-01 | | | 5.40E-02 | 1.48E-02 | 1.52E+00 |
| J. Catal. 191, 384–400 (2000) | FBR | 906 | gas | O ₂ | VO _x /MCM-41 | 2.00E-03 | 1.17E-01 | | | 9.90E-02 | 2.71E-02 | 1.49E+00 |
| J. Catal. 191, 384–400 (2000) | FBR | 929 | gas | O ₂ | VO _x /MCM-41 | 2.00E-03 | 8.40E-02 | | | 1.10E-01 | 3.01E-02 | 1.19E+00 |
| J. Catal. 190, 118–127 (2000) | FBR | 923 | gas | O ₂ | MoO _x /SiO ₂ | 4.00E-02 | 1.10E-01 | 2.30E-01 | 6.20E-01 | 1.20E-01 | 8.23E-03 | 2.12E-02 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | | 3.29E-01 | | | 1.33E-02 | | 3.29E-02 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | | 1.43E-01 | | | 1.23E-01 | | 1.31E-01 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 923 | gas | O ₂ | VO _x /SiO ₂ | | 3.67E-01 | | | 2.87E-01 | | 7.89E-01 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 823 | gas | O ₂ | VO _x /SiO ₂ | | 0.00E+00 | | | 0.00E+00 | | 0.00E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | | 5.71E-01 | | | 6.15E-02 | | 2.96E-01 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | | 4.28E-01 | | | 2.67E-01 | | 9.62E-01 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 923 | gas | O ₂ | VO _x /SiO ₂ | | 4.55E-01 | | | 3.28E-01 | | 1.26E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | | 2.14E-01 | | | 4.10E-02 | | 8.22E-02 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | | 4.00E-01 | | | 3.08E-01 | | 1.15E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 923 | gas | O ₂ | VO _x /SiO ₂ | | 3.21E-01 | | | 3.28E-01 | | 9.87E-01 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | | 4.14E-01 | | | 3.08E-01 | | 1.31E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | | 3.18E-01 | | | 3.59E-01 | | 1.18E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 923 | gas | O ₂ | VO _x /SiO ₂ | | 2.38E-01 | | | 3.59E-01 | | 8.82E-01 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | | 3.26E-01 | | | 3.64E-01 | | 1.33E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | | 2.41E-01 | | | 4.00E-01 | | 1.09E+00 |
| CHEM. COMMUN., 2002, 1184–1185 | FBR | 923 | gas | O ₂ | VO _x /SiO ₂ | | 2.14E-01 | | | 3.90E-01 | | 9.38E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | Q. Wool | 5.90E-02 | 7.94E-01 | | 1.46E-01 | 5.00E-04 | 3.80E-03 | 4.79E-02 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | SiO ₂ | 7.80E-02 | 4.50E-01 | 3.54E-01 | 1.12E-01 | 3.00E-03 | 3.01E-02 | 1.63E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 7.00E-03 | 4.90E-02 | 5.65E-01 | 1.68E-01 | 1.07E-01 | 9.64E-02 | 6.32E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 6.70E-02 | 1.29E-01 | 4.58E-01 | 1.87E-01 | 3.06E-02 | 2.64E-01 | 4.76E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 8.20E-02 | 2.58E-01 | 3.01E-01 | 1.59E-01 | 1.91E-02 | 2.02E-01 | 5.94E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 2.30E-02 | 1.70E-01 | 7.40E-02 | 4.99E-01 | 2.07E-02 | 6.13E-02 | 4.24E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 4.70E-02 | 3.22E-01 | 3.30E-02 | 4.76E-01 | 1.50E-02 | 9.07E-02 | 5.82E-01 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|-----------------------------------|---------|-------|-------|----------------|-----------------------------------|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 2.00E-03 | 7.60E-02 | 0.00E+00 | 9.22E-01 | 2.20E-02 | 5.66E-03 | 2.02E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 898 | gas | O ₂ | VO _x /SiO ₂ | 1.00E-03 | 6.60E-02 | 0.00E+00 | 9.33E-01 | 2.30E-02 | 2.96E-03 | 1.83E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 823 | gas | O ₂ | VO _x /SiO ₂ | 1.97E-01 | 5.60E-01 | 0.00E+00 | 2.43E-01 | 3.10E-03 | 7.86E-02 | 1.92E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 848 | gas | O ₂ | VO _x /SiO ₂ | 1.96E-01 | 2.74E-01 | 0.00E+00 | 3.25E-01 | 1.10E-02 | 2.78E-01 | 3.33E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | 7.20E-02 | 1.26E-01 | 3.60E-01 | 2.36E-01 | 2.00E-02 | 1.85E-01 | 2.78E-01 |
| Appl. Catal.A 247 (2003) 321–333 | FBR | 923 | gas | O ₂ | VO _x /SiO ₂ | 4.30E-02 | 7.10E-02 | 6.30E-01 | 1.41E-01 | 4.87E-02 | 2.70E-01 | 3.82E-01 |
| Appl. Catal.A 249 (2003) 345–354 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | 2.00E-03 | 2.97E-01 | 6.55E-01 | 4.60E-02 | 3.13E-02 | 2.79E-03 | 3.89E-01 |
| Appl. Catal.A 249 (2003) 345–354 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | 2.00E-03 | 4.73E-01 | 4.81E-01 | 4.40E-02 | 1.42E-02 | 2.06E-03 | 4.57E-01 |
| Appl. Catal.A 249 (2003) 345–354 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | 4.00E-03 | 5.54E-01 | 4.00E-01 | 4.20E-02 | 9.10E-03 | 3.62E-03 | 4.70E-01 |
| Appl. Catal.A 249 (2003) 345–354 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | 4.00E-03 | 3.64E-01 | 5.87E-01 | 4.50E-02 | 1.81E-02 | 1.37E-02 | 1.17E+00 |
| Appl. Catal.A 249 (2003) 345–354 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | 5.00E-03 | 4.82E-01 | 4.76E-01 | 3.70E-02 | 1.17E-02 | 1.67E-02 | 1.51E+00 |
| Appl. Catal.A 249 (2003) 345–354 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | 8.00E-03 | 6.33E-01 | 3.26E-01 | 3.30E-02 | 5.80E-03 | 2.21E-02 | 1.64E+00 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ | | 4.62E-01 | | | 3.20E-03 | | 4.76E-03 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ | | 3.97E-01 | | | 9.10E-03 | | 1.16E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ | | 2.64E-01 | | | 2.47E-02 | | 2.10E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ /SBA-15 | | 8.13E-01 | | | 5.60E-03 | | 3.66E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ /SBA-15 | | 7.28E-01 | | | 1.16E-02 | | 6.79E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ /SBA-15 | | 4.90E-01 | | | 2.73E-02 | | 1.08E-01 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ /SBA-15 | | 7.51E-01 | | | 6.70E-03 | | 4.05E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ /SBA-15 | | 6.31E-01 | | | 1.37E-02 | | 6.95E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ /SBA-15 | | 3.88E-01 | | | 3.39E-02 | | 1.06E-01 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ /SBA-15 | | 7.61E-01 | | | 6.80E-03 | | 4.16E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ /SBA-15 | | 6.14E-01 | | | 1.44E-02 | | 7.11E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ /SBA-15 | | 3.60E-01 | | | 3.30E-02 | | 9.56E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ /SBA-15 | | 7.42E-01 | | | 7.30E-03 | | 4.36E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ /SBA-15 | | 6.10E-01 | | | 1.34E-02 | | 6.58E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ /SBA-15 | | 3.33E-01 | | | 3.33E-02 | | 8.92E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ /SBA-15 | | 6.88E-01 | | | 6.10E-03 | | 3.38E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ /SBA-15 | | 5.03E-01 | | | 1.34E-02 | | 5.42E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ /SBA-15 | | 2.72E-01 | | | 3.43E-02 | | 7.51E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | FePO ₄ /MCM-41 | | 6.72E-01 | | | 5.40E-03 | | 2.92E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | FePO ₄ /MCM-41 | | 4.27E-01 | | | 1.53E-02 | | 5.26E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | FePO ₄ /MCM-41 | | 2.93E-01 | | | 3.24E-02 | | 7.64E-02 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 773 | gas | O ₂ | SBA-15 | | 2.49E-01 | | | 2.30E-04 | | 4.61E-04 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 823 | gas | O ₂ | SBA-15 | | 4.43E-01 | | | 8.20E-04 | | 2.92E-03 |
| Catal. Today 93–95 (2004) 155–161 | FBR | 873 | gas | O ₂ | SBA-15 | | 6.02E-01 | | | 2.30E-03 | | 1.11E-02 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | SiO ₂ | | 7.50E-01 | 1.60E-01 | 6.00E-02 | 3.80E-02 | | 3.08E-01 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | SiO ₂ | | 6.60E-01 | 2.60E-01 | 8.00E-02 | 2.70E-02 | | 1.93E-01 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 5.50E-01 | 2.80E-01 | 1.70E-01 | 8.60E-02 | | 5.25E-01 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 5.40E-01 | 2.70E-01 | 1.90E-01 | 9.90E-02 | | 5.80E-01 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|---------------------------------------|---------|-------|-------|------------------|---|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 4.70E-01 | 2.20E-01 | 3.10E-01 | 7.80E-02 | | 4.05E-01 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 3.30E-01 | 2.90E-01 | 3.80E-01 | 3.72E-01 | | 1.35E+00 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 6.30E-01 | 2.50E-01 | 1.20E-01 | 1.46E-01 | | 1.02E+00 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 3.60E-01 | 3.70E-01 | 2.70E-01 | 3.42E-01 | | 1.36E+00 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 5.50E-01 | 2.30E-01 | 2.20E-01 | 4.60E-02 | | 2.80E+00 |
| J. Catal. 231 (2005) 365–380 | RBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 5.40E-01 | 2.30E-01 | 2.30E-01 | 4.80E-02 | | 2.87E+00 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 1.58E-01 | 0.00E+00 | 0.00E+00 | 1.52E-01 | | 2.27E-01 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 2.00E-01 | 0.00E+00 | 0.00E+00 | 7.10E-02 | | 6.08E-01 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 1.40E-01 | 0.00E+00 | 0.00E+00 | 3.10E-02 | | 4.11E-02 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 2.14E-01 | 0.00E+00 | 0.00E+00 | 2.50E-02 | | 2.29E-01 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | | 4.80E-01 | 3.80E-01 | 1.40E-01 | 2.50E-02 | | 3.10E-02 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | | 4.20E-01 | 4.60E-01 | 1.10E-01 | 2.50E-02 | | 2.58E-02 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | | 4.10E-01 | 4.80E-01 | 1.00E-01 | 2.50E-02 | | 2.65E-02 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | | 4.00E-01 | 4.90E-01 | 1.00E-01 | 2.50E-02 | | 2.46E-02 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | | 4.50E-01 | 4.40E-01 | 1.10E-01 | 2.50E-02 | | 1.08E-01 |
| J. Catal. 238 (2006) 277–285 | FBR | 873 | gas | O ₂ | MoO _x /SiO ₂ | | 4.00E-01 | 5.20E-01 | 8.00E-02 | 2.50E-02 | | 9.60E-02 |
| Chemistry Letters Vol.35, No.6 (2006) | FBR | 898 | gas | O ₂ | CuO/SBA-15 | | 4.20E-01 | 4.50E-01 | 1.30E-01 | 3.80E-02 | | 5.14E-01 |
| J. Catal. 237 (2006) 38–48 | FBR | 825 | gas | O ₂ | VO _x /SiO ₂ | 2.00E-02 | 8.22E-01 | 1.49E-01 | 9.00E-03 | 2.30E-02 | 2.00E-02 | 7.70E-01 |
| J. Catal. 237 (2006) 38–48 | FBR | 858 | gas | O ₂ | VO _x /SiO ₂ | 7.00E-03 | 4.89E-01 | 4.82E-01 | 2.20E-02 | 7.70E-02 | 2.34E-02 | 1.53E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 822 | gas | O ₂ | VO _x /SiO ₂ | 6.00E-02 | 9.19E-01 | 1.40E-02 | 7.00E-03 | 9.00E-03 | 5.43E-02 | 7.79E-01 |
| J. Catal. 237 (2006) 38–48 | FBR | 854 | gas | O ₂ | VO _x /SiO ₂ | 1.80E-02 | 7.42E-01 | 2.31E-01 | 1.00E-02 | 3.50E-02 | 6.33E-02 | 2.45E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | 1.10E-02 | 5.75E-01 | 3.99E-01 | 1.40E-02 | 6.30E-02 | 6.96E-02 | 3.41E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 825 | gas | O ₂ | VO _x /SiO ₂ | 1.07E-01 | 8.61E-01 | 0.00E+00 | 3.20E-02 | 2.00E-03 | 6.34E-02 | 4.78E-01 |
| J. Catal. 237 (2006) 38–48 | FBR | 851 | gas | O ₂ | VO _x /SiO ₂ | 6.20E-02 | 9.04E-01 | 2.90E-02 | 5.00E-03 | 9.00E-03 | 1.65E-01 | 2.26E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 871 | gas | O ₂ | VO _x /SiO ₂ | 3.40E-02 | 8.01E-01 | 1.55E-01 | 9.00E-03 | 2.10E-02 | 2.11E-01 | 4.67E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 823 | gas | O ₂ | VO _x /SiO ₂ | 7.00E-02 | 8.93E-01 | 0.00E+00 | 3.70E-02 | 1.00E-03 | 2.81E-02 | 3.36E-01 |
| J. Catal. 237 (2006) 38–48 | FBR | 852 | gas | O ₂ | VO _x /SiO ₂ | 5.50E-02 | 9.35E-01 | 0.00E+00 | 1.00E-02 | 8.00E-03 | 1.77E-01 | 2.82E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 873 | gas | O ₂ | VO _x /SiO ₂ | 3.40E-02 | 9.33E-01 | 2.30E-02 | 9.00E-03 | 1.90E-02 | 2.60E-01 | 6.68E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 868 | gas | O ₂ | VO _x /MCM-41 | 6.00E-03 | 2.76E-01 | 6.61E-01 | 5.30E-02 | 3.10E-02 | 2.56E-02 | 1.10E+00 |
| J. Catal. 237 (2006) 38–48 | FBR | 853 | gas | O ₂ | VO _x /MCM-41 | 5.00E-03 | 4.19E-01 | 5.40E-01 | 3.60E-02 | 5.80E-02 | 1.26E-02 | 9.90E-01 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 973 | gas | O ₂ | H ₄ PMo ₁₁ VO ₄₀ | 1.99E-01 | 7.28E-02 | 4.35E-01 | 4.09E-01 | 3.00E-02 | 6.09E-02 | 2.09E-02 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 1023 | gas | O ₂ | H ₄ PMo ₁₁ VO ₄₀ | 1.23E-01 | 1.56E-01 | 4.59E-01 | 4.50E-01 | 1.30E-01 | 1.63E-01 | 1.95E-01 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 973 | gas | O ₂ | (NH ₄) ₄ PMo ₁₁ FeO ₃₉ | 2.37E-01 | 1.29E-01 | 4.35E-01 | 1.99E-01 | 4.00E-02 | 9.67E-02 | 4.95E-02 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 1023 | gas | O ₂ | (NH ₄) ₄ PMo ₁₁ FeO ₃₉ | 1.06E-01 | 2.61E-01 | 4.59E-01 | 1.74E-01 | 2.30E-01 | 2.50E-01 | 5.74E-01 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 973 | gas | O ₂ | (NH ₄) ₆ HSiMo ₁₁ FeO ₄₀ | 2.15E-01 | 8.23E-02 | 2.32E-01 | 4.71E-01 | 4.00E-02 | 8.76E-02 | 3.15E-02 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 1023 | gas | O ₂ | (NH ₄) ₆ HSiMo ₁₁ FeO ₄₀ | 7.85E-02 | 2.05E-01 | 2.79E-01 | 4.38E-01 | 3.20E-01 | 2.56E-01 | 6.27E-01 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 973 | gas | N ₂ O | H ₄ PMo ₁₁ VO ₄₀ | 2.27E-01 | 0.00E+00 | 0.00E+00 | 7.73E-01 | 2.00E-02 | 4.64E-02 | 0.00E+00 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 1023 | gas | N ₂ O | H ₄ PMo ₁₁ VO ₄₀ | 1.67E-01 | 5.45E-02 | 1.56E-01 | 6.23E-01 | 6.00E-02 | 1.02E-01 | 3.13E-02 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 973 | gas | N ₂ O | (NH ₄) ₄ PMo ₁₁ FeO ₃₉ | 3.13E-01 | 0.00E+00 | 1.64E-01 | 5.22E-01 | 2.00E-02 | 6.40E-02 | 0.00E+00 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 1023 | gas | N ₂ O | (NH ₄) ₄ PMo ₁₁ FeO ₃₉ | 2.21E-01 | 1.37E-01 | 4.33E-01 | 2.09E-01 | 8.00E-02 | 1.81E-01 | 1.05E-01 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|-------------------------------------|---------|-------|-------|------------------|---|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 973 | gas | N ₂ O | (NH ₄) ₆ HSiMo ₁₁ FeO ₄₀ | 2.26E-01 | 1.03E-01 | 4.64E-01 | 2.08E-01 | 6.00E-02 | 1.38E-01 | 5.91E-02 |
| J. Natur. Gas Chem. 17(2008)309–312 | FBR | 1023 | gas | N ₂ O | (NH ₄) ₆ HSiMo ₁₁ FeO ₄₀ | 1.59E-01 | 2.11E-01 | 4.33E-01 | 1.98E-01 | 1.30E-01 | 2.11E-01 | 2.62E-01 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x /SBA-15 | | 7.00E-01 | 2.80E-01 | 2.30E-02 | 1.90E-02 | | 8.01E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 4.40E-01 | 4.30E-01 | 1.20E-01 | 2.40E-02 | | 6.36E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x +VO _x /SBA-15 | | 6.40E-01 | 3.40E-01 | 1.60E-02 | 1.50E-02 | | 5.78E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x +VO _x /SBA-15 | | 6.30E-01 | 3.50E-01 | 2.00E-02 | 1.20E-02 | | 4.55E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 2.10E-01 | 7.10E-01 | 8.30E-02 | 1.10E-01 | | 1.39E-01 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x +VO _x /SBA-15 | | 2.30E-01 | 7.30E-01 | 3.80E-02 | 3.80E-02 | | 5.26E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x +VO _x /SBA-15 | | 4.20E-01 | 5.60E-01 | 1.60E-02 | 1.50E-02 | | 3.79E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 4.20E-01 | 4.70E-01 | 1.10E-01 | 2.70E-02 | | 6.83E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x +VO _x /SBA-15 | | 6.60E-01 | 3.20E-01 | 1.80E-02 | 1.60E-02 | | 6.36E-02 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | VO _x /SBA-15 | | 7.70E-02 | 8.00E-01 | 1.20E-01 | 2.20E-01 | | 1.02E-01 |
| Appl. Catal.A 350 (2008) 118–125 | FBR | 873 | gas | O ₂ | MoO _x +VO _x /SBA-15 | | 3.90E-01 | 5.80E-01 | 3.40E-02 | 1.90E-02 | | 4.46E-02 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 723 | gas | O ₂ | SiO ₂ | | | | | 0.00E+00 | | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 773 | gas | O ₂ | SiO ₂ | | | | | 0.00E+00 | | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 823 | gas | O ₂ | SiO ₂ | | | | 1.00E+00 | 1.00E-03 | | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 873 | gas | O ₂ | SiO ₂ | | | | 1.00E+00 | 1.00E-03 | | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 923 | gas | O ₂ | SiO ₂ | | 2.80E-01 | | 7.20E-01 | 3.00E-03 | | 2.84E-02 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 973 | gas | O ₂ | SiO ₂ | | 3.95E-01 | | 5.60E-01 | 4.00E-03 | | 5.33E-02 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 1023 | gas | O ₂ | SiO ₂ | | 4.50E-01 | | 4.40E-01 | 6.00E-03 | | 9.12E-02 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 673 | gas | O ₂ | FeOx/SiO ₂ | | 0.00E+00 | | 0.00E+00 | 0.00E+00 | | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 723 | gas | O ₂ | FeOx/SiO ₂ | | 0.00E+00 | | 0.00E+00 | 0.00E+00 | | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 773 | gas | O ₂ | FeOx/SiO ₂ | 6.55E-01 | 6.70E-02 | | 2.78E-01 | 3.00E-03 | 7.08E-02 | 6.79E-03 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 823 | gas | O ₂ | FeOx/SiO ₂ | 8.73E-01 | 2.10E-02 | | 1.06E-01 | 1.70E-02 | 5.35E-01 | 1.21E-02 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | 9.11E-01 | | | 8.90E-02 | 5.30E-02 | 1.74E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 923 | gas | O ₂ | FeOx/SiO ₂ | 8.79E-01 | | 1.00E-02 | 1.11E-01 | 6.90E-02 | 2.18E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 973 | gas | O ₂ | FeOx/SiO ₂ | 8.54E-01 | | 1.00E-03 | 1.39E-01 | 7.70E-02 | 2.37E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 1023 | gas | O ₂ | FeOx/SiO ₂ | 8.39E-01 | | 2.30E-02 | 1.24E-01 | 1.11E-01 | 3.35E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 673 | gas | O ₂ | FeOx/SiO ₂ | 9.28E-01 | | 0.00E+00 | 7.20E-02 | 2.00E-03 | 6.69E-02 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 723 | gas | O ₂ | FeOx/SiO ₂ | 5.84E-01 | | 0.00E+00 | 4.16E-01 | 1.00E-03 | 2.10E-02 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 773 | gas | O ₂ | FeOx/SiO ₂ | 8.12E-01 | | 0.00E+00 | 1.88E-01 | 1.00E-02 | 2.93E-01 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 823 | gas | O ₂ | FeOx/SiO ₂ | 8.29E-01 | | 0.00E+00 | 1.71E-01 | 5.20E-02 | 1.55E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | 7.90E-01 | | 0.00E+00 | 2.10E-01 | 1.06E-01 | 3.02E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 923 | gas | O ₂ | FeOx/SiO ₂ | 7.78E-01 | | 2.20E-02 | 2.00E-01 | 1.29E-01 | 3.62E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 973 | gas | O ₂ | FeOx/SiO ₂ | 7.88E-01 | | 3.50E-02 | 1.75E-01 | 1.32E-01 | 3.75E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 1023 | gas | O ₂ | FeOx/SiO ₂ | 7.27E-01 | | 1.52E-01 | 1.15E-01 | 1.36E-01 | 3.56E+00 | 0.00E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 673 | gas | O ₂ | FeOx/SiO ₂ | | 8.73E-01 | | 1.27E-01 | 2.00E-03 | | 5.90E-02 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 723 | gas | O ₂ | FeOx/SiO ₂ | | 8.22E-01 | | 1.78E-01 | 6.00E-03 | | 1.67E-01 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 773 | gas | O ₂ | FeOx/SiO ₂ | | 6.93E-01 | | 3.07E-01 | 1.30E-02 | | 3.04E-01 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 823 | gas | O ₂ | FeOx/SiO ₂ | 1.90E-02 | 5.14E-01 | 1.38E-01 | 3.29E-01 | 3.10E-02 | 2.12E-02 | 5.38E-01 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|---|---------|-------|-------|----------------|--|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| Catal. Commun. 9 (2008) 864–869 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | 1.70E-02 | 4.75E-01 | 2.38E-01 | 2.70E-01 | 7.30E-02 | 4.47E-02 | 1.17E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 923 | gas | O ₂ | FeOx/SiO ₂ | | 5.06E-01 | 2.31E-01 | 2.63E-01 | 8.60E-02 | | 1.47E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 973 | gas | O ₂ | FeOx/SiO ₂ | | 5.27E-01 | 2.46E-01 | 2.21E-01 | 8.50E-02 | | 1.51E+00 |
| Catal. Commun. 9 (2008) 864–869 | FBR | 1023 | gas | O ₂ | FeOx/SiO ₂ | 1.17E-01 | 2.96E-01 | 3.31E-01 | 2.28E-01 | 8.50E-02 | 3.58E-01 | 8.49E-01 |
| J. Molec. Catal. 285 (2008) 169–175 | FBR | 923 | gas | O ₂ | Al/SiO ₂ | 0.00E+00 | 2.50E-02 | 7.10E-01 | 1.60E-01 | | | |
| J. Phys. Chem. C 2008, 112, 13700–13708 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 7.10E-01 | 1.90E-01 | 1.00E-01 | 1.20E-02 | | |
| J. Phys. Chem. C 2008, 112, 13700–13708 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 4.20E-01 | 4.50E-01 | 1.30E-01 | 3.80E-02 | | |
| J. Phys. Chem. C 2008, 112, 13700–13708 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 5.80E-01 | 3.20E-01 | 1.00E-01 | 2.30E-02 | | |
| Appl. Catal.A 356 (2009) 103–111 | FBR | 898 | gas | O ₂ | FeOx/SBA-15 | | 6.90E-01 | 1.60E-01 | 1.50E-01 | 1.70E-02 | | 3.77E-01 |
| Appl. Catal.A 356 (2009) 103–111 | FBR | 898 | gas | O ₂ | FeOx/SBA-15 | | 5.50E-01 | 2.20E-01 | 2.30E-01 | 2.60E-02 | | 4.60E-01 |
| Appl. Catal.A 356 (2009) 103–111 | FBR | 898 | gas | O ₂ | FeOx/SBA-15 | | 3.70E-01 | 3.90E-01 | 2.40E-01 | 5.00E-02 | | 5.95E-01 |
| Appl. Catal.A 356 (2009) 103–111 | FBR | 898 | gas | O ₂ | FeOx/SBA-15 | | 3.60E-01 | 3.20E-01 | 3.20E-01 | 4.70E-02 | | 5.44E-01 |
| Appl. Catal.A 356 (2009) 103–111 | FBR | 898 | gas | O ₂ | FeOx/SBA-15 | | 3.00E-01 | 2.90E-01 | 4.10E-01 | 3.70E-02 | | 3.57E-01 |
| Appl. Catal.A 356 (2009) 103–111 | FBR | 898 | gas | O ₂ | FeOx/SBA-15 | | 2.00E-02 | 1.40E-01 | 8.40E-01 | 6.70E-02 | | 4.31E-02 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | SiO ₂ | | 9.90E-01 | 0.00E+00 | 1.00E-02 | 4.00E-03 | | 1.27E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FeOx/SiO ₂ | | 4.60E-01 | 2.60E-01 | 2.80E-01 | 2.90E-02 | | 4.29E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FeOx/SiO ₂ | | 2.90E-01 | 4.10E-01 | 2.90E-01 | 6.60E-02 | | 6.16E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FeOx/SiO ₂ | | 2.80E-01 | 4.20E-01 | 3.00E-01 | 7.10E-02 | | 6.40E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FeOx/SiO ₂ | | 3.10E-01 | 3.50E-01 | 3.40E-01 | 5.20E-02 | | 5.19E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 723 | gas | O ₂ | FeOx/SiO ₂ | | 6.80E-01 | | | 5.00E-03 | | 1.09E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 823 | gas | O ₂ | FeOx/SiO ₂ | | 5.30E-01 | | | 1.50E-02 | | 2.56E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | | 3.60E-01 | | | 4.10E-02 | | 4.75E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 723 | gas | O ₂ | FeOx/SiO ₂ | | 6.70E-01 | | | 2.00E-03 | | 4.31E-02 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 823 | gas | O ₂ | FeOx/SiO ₂ | | 5.00E-01 | | | 5.00E-03 | | 8.04E-02 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 873 | gas | O ₂ | FeOx/SiO ₂ | | 3.70E-01 | | | 1.40E-02 | | 1.67E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FeOx/SiO ₂ | | 2.90E-01 | | | 2.50E-02 | | 2.33E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | Li-FeOx/SiO ₂ | | 3.30E-01 | 2.80E-01 | 3.90E-01 | 5.90E-02 | | 6.27E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | B-FeOx/SiO ₂ | | 2.30E-01 | 3.90E-01 | 3.80E-01 | 8.30E-02 | | 3.07E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | S-FeOx/SiO ₂ | | 2.20E-01 | 3.80E-01 | 4.00E-01 | 8.30E-02 | | 2.94E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FePO ₄ /SiO ₂ | | 4.00E-01 | 4.00E-01 | 2.00E-01 | 6.00E-02 | | 3.86E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | FePO ₄ /SiO ₂ | | 7.30E-01 | 2.00E-01 | 7.00E-02 | 1.60E-02 | | 1.88E-01 |
| J. Natur. Gas Chem. 18(2009) 288–294 | FBR | 898 | gas | O ₂ | Mo-FeOx/SiO ₂ | | 3.70E-01 | 2.60E-01 | 3.70E-01 | 3.90E-02 | | 4.64E-01 |
| Catal. Commun. 10 (2009) 1875–1880 | FBR | 623 | gas | O ₂ | Ce ₂ Zr _{2-0.4} Fe _{0.4} O _{8-d} | | 5.20E-01 | | | 2.00E-03 | | |
| Catal. Commun. 10 (2009) 1875–1880 | FBR | 823 | gas | O ₂ | Ce ₂ Zr _{2-0.4} Fe _{0.4} O _{8-d} | | 2.50E-02 | | | 5.20E-02 | | |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | SBA-15 | | 9.60E-01 | 0.00E+00 | 4.00E-02 | 3.00E-03 | | 9.27E-02 |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 7.10E-01 | 7.00E-02 | 2.20E-01 | 1.10E-02 | | 2.51E-01 |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 7.10E-01 | 1.10E-01 | 1.80E-01 | 1.80E-02 | | 4.11E-01 |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 6.50E-01 | 1.60E-01 | 1.90E-01 | 1.80E-02 | | 3.77E-01 |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 5.00E-01 | 2.00E-01 | 3.00E-01 | 2.20E-02 | | 3.54E-01 |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 5.00E-01 | 1.70E-01 | 3.30E-01 | 1.80E-02 | | 2.90E-01 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] | |
|---|---------|-------|--------|--|--|------------------------|-----------------------|----------|----------------------|----------------------|---|--|----------|
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 3.60E-01 | 1.30E-01 | 5.10E-01 | 2.40E-02 | | 2.78E-01 | |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 5.00E-01 | 1.20E-01 | 3.80E-01 | 1.70E-02 | | 2.74E-01 | |
| Catal. Today 157 (2010) 143–148 | FBR | 898 | gas | O ₂ | CuO _x /SBA-15 | | 3.40E-01 | 6.00E-02 | 6.00E-01 | 2.00E-02 | | 2.19E-01 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 773 | gas | O ₂ | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 4.44E-02 | 9.56E-01 | | | 1.11E-03 | 3.30E-04 | 6.66E-03 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 823 | gas | O ₂ | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 5.56E-02 | 9.44E-01 | | | 1.48E-03 | 5.51E-04 | 8.77E-03 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 873 | gas | O ₂ | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 3.33E-02 | 9.67E-01 | | | 4.44E-03 | 9.91E-04 | 2.69E-02 | |
| Appl. Catal.A 400 (2011) 122–131 | FBR | 903 | gas | O ₂ | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 3.33E-02 | 9.67E-01 | | | 7.04E-03 | 1.57E-03 | 4.27E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 933 | gas | O ₂ | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 1.11E-02 | 5.44E-01 | | | 1.56E-02 | 1.16E-03 | 5.31E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 723 | gas | O ₂ + N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 3.26E-02 | 9.67E-01 | | | 1.40E-03 | 3.06E-04 | 8.51E-03 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 773 | gas | O ₂ + N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 6.52E-02 | 9.35E-01 | | | 3.51E-03 | 1.53E-03 | 2.06E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 823 | gas | O ₂ + N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 4.35E-02 | 9.57E-01 | | | 5.61E-03 | 1.63E-03 | 3.37E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 873 | gas | O ₂ + N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 3.26E-02 | 6.63E-01 | 3.04E-01 | 0.00E+00 | 1.19E-02 | 2.60E-03 | 4.96E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | O ₂ + N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 1.09E-02 | 4.35E-01 | 5.54E-01 | 0.00E+00 | 2.11E-02 | 1.53E-03 | 5.74E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 933 | gas | O ₂ + N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 1.09E-02 | 2.83E-01 | 7.07E-01 | 0.00E+00 | 3.30E-02 | 2.40E-03 | 5.84E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 673 | gas | N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 4.60E-01 | 5.40E-01 | | | 7.41E-04 | 2.28E-03 | 2.51E-03 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 723 | gas | N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 4.02E-01 | 5.98E-01 | | | 3.33E-03 | 8.97E-03 | 1.25E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 773 | gas | N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 2.93E-01 | 7.07E-01 | | | 8.52E-03 | 1.67E-02 | 3.78E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 823 | gas | N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 1.03E-01 | 5.29E-01 | | | 2.22E-02 | 1.54E-02 | 7.37E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 873 | gas | N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 1.72E-02 | 3.10E-01 | 5.63E-01 | 1.09E-01 | 5.56E-02 | 6.41E-03 | 1.08E-01 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Cu ^{II} Fe ^{III} ₂ (P ₂ O ₇) ₂ | 1.80E-02 | 2.66E-01 | 5.94E-01 | 1.22E-01 | 6.40E-02 | 7.71E-03 | 1.07E-01 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Cu ^{II} ₂ (P ₂ O ₇) | 1.90E-02 | 2.64E-01 | 5.03E-01 | 2.14E-01 | 4.50E-02 | 5.72E-03 | 7.45E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Cu ^{II} _{3.25} Fe ^{III} _{0.5} (P ₂ O ₇) ₂ | 2.60E-02 | 2.51E-01 | 5.38E-01 | 1.85E-01 | 4.80E-02 | 8.35E-03 | 7.55E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Cu ^{II} _{2.5} Fe ^{III} ₁ (P ₂ O ₇) ₂ | 2.50E-02 | 2.31E-01 | 6.13E-01 | 1.31E-01 | 5.10E-02 | 8.53E-03 | 7.39E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Cu ^{II} _{1.75} Fe ^{III} _{1.5} (P ₂ O ₇) ₂ | 2.30E-02 | 2.33E-01 | 6.19E-01 | 1.25E-01 | 5.40E-02 | 8.31E-03 | 7.89E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Cu ^{II} _{0.5} Fe ^{III} _{2.5} (P ₂ O ₇) _{2.125} | 9.10E-02 | 7.18E-01 | 1.91E-01 | 0.00E+00 | 1.50E-02 | 9.13E-03 | 6.75E-02 | |
| Appl. Catal.A 400 (2011) 122–130 | FBR | 903 | gas | N ₂ O | Fe ^{III} ₃ (P ₂ O ₇) _{2.25} | 1.01E-01 | 7.15E-01 | 1.84E-01 | 0.00E+00 | 1.30E-02 | 8.78E-03 | 5.83E-02 | |
| J. Am. Chem. Soc. 2011, 133, 17257–17261 | BR | room | gas | | Beta 811 Zeolite | | 5.65E-01 | 2.58E-01 | | 6.20E-02 | 2.49E-02 | | |
| Appl. Catal.A 398 (2011) 150–154 | BR | 363 | liquid | K ₂ S ₂ O ₈ | Au/SiO ₂ | | 7.15E-01 | 0.00E+00 | | 2.50E-01 | 9.43E-03 | | |
| Catal. Today 192 (2012) 20–27 | FBR | 923 | gas | O ₂ | VO _x /MCM-41 | | | 1.50E-02 | 6.00E-01 | 3.85E-01 | 1.06E-01 | 0.00E+00 | 1.75E-01 |
| Catal. Today 192 (2012) 20–27 | FBR | 923 | gas | O ₂ | VO _x /MCM-41 | | | 3.00E-02 | 6.00E-01 | 3.70E-01 | 8.10E-02 | 0.00E+00 | 2.68E-01 |
| Catal. Today 192 (2012) 20–27 | FBR | 923 | gas | O ₂ | VO _x /MCM-41 | | | 7.00E-03 | 6.00E-01 | 3.93E-01 | 1.39E-01 | 0.00E+00 | 1.07E-01 |
| Catal. Today 192 (2012) 20–27 | FBR | 923 | gas | O ₂ | VO _x /MCM-41 | | | 8.80E-02 | 6.00E-01 | 3.12E-01 | 8.00E-02 | 0.00E+00 | 7.75E-01 |
| Catal. Today 192 (2012) 20–27 | FBR | 923 | gas | O ₂ | VO _x /MCM-41 | | | 2.50E-02 | 6.00E-01 | 3.75E-01 | 8.50E-02 | 0.00E+00 | 2.34E-01 |
| Catal. Today 192 (2012) 20–27 | FBR | 923 | gas | O ₂ | VO _x /MCM-41 | | | 7.00E-03 | 6.00E-01 | 3.93E-01 | 1.02E-01 | 0.00E+00 | 7.86E-02 |
| Angew. Chem. Int. Ed. 2012, 51, 5129–5133 | BR | 323 | liquid | H ₂ O ₂ | ZSM-5 (30) | | 1.90E-01 | | | 5.00E-02 | 3.00E-03 | 3.65E-02 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129–5133 | BR | 323 | liquid | H ₂ O ₂ | silicate-1 | | 0.00E+00 | | | 0.00E+00 | 0.00E+00 | 0.00E+00 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129–5133 | BR | 323 | liquid | H ₂ O ₂ | Al/ZSM-5 (30) | | 2.20E-01 | | | 2.00E-02 | 2.00E-03 | 3.75E-02 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129–5133 | BR | 323 | liquid | H ₂ O ₂ | TS-1 | | 1.50E-01 | | | 1.00E-02 | 0.00E+00 | 4.75E-04 | |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|---|------------------|-------|--------|-------------------------------|--|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Fe/ZSM-5 (30) | 1.20E-01 | | | 1.70E-01 | 7.00E-03 | 5.29E-02 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Fe-Silicate-1 | 1.70E-01 | | | 6.00E-02 | 3.00E-03 | 3.65E-02 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Fe(NO ₃) ₃ | 9.00E-02 | | | 4.90E-01 | 1.00E-03 | 8.31E-03 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | ZSM-5 (30)/Na ₂ SO ₃ | 3.20E-01 | | | 3.00E-02 | 2.00E-03 | 5.43E-02 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Fe(NO ₃) ₃ /Na ₂ SO ₃ | 1.50E-01 | | | 1.50E-01 | 0.00E+00 | 3.09E-03 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Cu/ZSM-5 (30) | 8.30E-01 | | | 1.20E-01 | 3.00E-03 | 1.55E-01 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Cu-Fe/ZSM-5 (30) | 8.50E-01 | | | 1.50E-01 | 7.00E-03 | 4.48E-01 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Fe/ZSM-5 (30) / Cu(NO ₃) ₃ | 8.80E-01 | | | 1.20E-01 | 5.00E-03 | 3.33E-01 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 323 | liquid | H ₂ O ₂ | Cu/silicate-1 | 0.00E+00 | | | 0.00E+00 | 0.00E+00 | 0.00E+00 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 343 | liquid | H ₂ O ₂ | Fe-silicate-1 | 8.00E-02 | | | 4.00E-02 | 1.05E-01 | 1.79E-02 | |
| Angew. Chem. Int. Ed. 2012, 51, 5129 – 5133 | BR | 343 | liquid | H ₂ O ₂ | Fe-silicate-1 and Cu/Silicate-1 | 9.30E-01 | | | 7.00E-02 | 1.01E-01 | 2.00E-01 | |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 873 | gas | O ₂ | Cs ₄ [PW ₁₁ O ₃₉ Fe] | 1.78E-01 | 1.65E-01 | 3.68E-01 | 2.89E-01 | 8.00E-03 | 1.45E-02 | 1.26E-02 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 923 | gas | O ₂ | Cs ₄ [PW ₁₁ O ₃₉ Fe] | 7.30E-02 | 2.31E-01 | 2.35E-01 | 4.61E-01 | 4.00E-02 | 2.98E-02 | 8.84E-02 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 873 | gas | N ₂ O | Cs ₄ [PW ₁₁ O ₃₉ Fe] | 3.36E-01 | 1.56E-01 | 4.68E-01 | 4.00E-02 | 5.00E-02 | 1.72E-01 | 7.46E-02 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 923 | gas | N ₂ O | Cs ₄ [PW ₁₁ O ₃₉ Fe] | 1.46E-01 | 2.40E-01 | 4.04E-01 | 2.10E-01 | 1.10E-01 | 1.64E-01 | 2.53E-01 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 873 | gas | O ₂ | Cs ₅ [PW ₁₁ O ₃₉ Co] | 1.48E-01 | 1.63E-01 | 4.66E-01 | 2.23E-01 | 1.00E-02 | 1.51E-02 | 1.56E-02 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 923 | gas | O ₂ | Cs ₅ [PW ₁₁ O ₃₉ Co] | 6.60E-02 | 2.25E-01 | 3.49E-01 | 3.60E-01 | 6.00E-02 | 4.04E-02 | 1.29E-01 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 873 | gas | N ₂ O | Cs ₅ [PW ₁₁ O ₃₉ Co] | 2.57E-01 | 5.10E-02 | 5.09E-01 | 1.83E-01 | 3.00E-02 | 7.87E-02 | 1.46E-02 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 923 | gas | N ₂ O | Cs ₅ [PW ₁₁ O ₃₉ Co] | 1.00E-01 | 2.06E-01 | 4.29E-01 | 2.64E-01 | 1.00E-01 | 1.02E-01 | 1.97E-01 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 873 | gas | O ₂ | Cs ₅ [PW ₁₁ O ₃₉ Ni] | 2.20E-02 | 3.80E-02 | 9.80E-02 | 8.42E-01 | 3.00E-02 | 6.74E-03 | 1.09E-02 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 923 | gas | O ₂ | Cs ₅ [PW ₁₁ O ₃₉ Ni] | 0.00E+00 | 0.00E+00 | 5.80E-02 | 9.42E-01 | 7.00E-02 | 0.00E+00 | 0.00E+00 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 873 | gas | N ₂ O | Cs ₅ [PW ₁₁ O ₃₉ Ni] | 1.12E-01 | 4.10E-02 | 6.07E-01 | 2.40E-01 | 2.00E-02 | 2.29E-02 | 7.85E-03 |
| J. Molec. Catal. 379 (2013) 255– 262 | FBR | 923 | gas | N ₂ O | Cs ₅ [PW ₁₁ O ₃₉ Ni] | 5.00E-02 | 8.10E-02 | 5.08E-01 | 3.60E-01 | 8.00E-02 | 4.08E-02 | 6.20E-02 |
| Angew. Chem. Int. Ed. 2013, 52, 1280 – 1284 | BR | 323 | liquid | NADH/O ₂ | AuPd/TiO ₂ | 8.92E-01 | | | | 1.00E-04 | 2.59E-03 | |
| J. Photochem. Photobio. 264 (2013) 48– 55 | BR + photo | 573 | gas | NO | V-MCM-41 | 8.84E-01 | | | | 7.10E-02 | 8.53E-05 | |
| Chem. Commun., 2013, 49, 240–242 | BR | 488 | liquid | SO ₃ | Pt@ExLOB-900 | 9.40E-01 | | | | 3.38E-01 | | |
| ACS Catal. 2014, 4, 3013–3019 | CSTR / photocat. | 328 | liquid | | Bi ₂ WO ₆ | 2.76E-01 | | | 6.34E-01 | 1.40E-02 | 4.91E-04 | 0.00E+00 |
| Catal. Sci. Technol., 2014, 4, 930–935 | BR | 298 | liquid | H ₂ O ₂ | trimetallic copper complex | 1.00E+00 | | | 0.00E+00 | 3.25E-02 | 1.40E-03 | 0.00E+00 |
| Chem. Commun., 2014, 50, 11053 | | 423 | gas | NO | Cu–ZSM-5 | 1.00E+00 | | | 0.00E+00 | | | 0.00E+00 |
| Chem. Commun., 2014, 50, 11053 | | 573 | gas | N ₂ O | Cu–ZSM-5 | 1.00E+00 | | | 0.00E+00 | | | 0.00E+00 |
| Chem. Commun., 2014, 50, 11053 | | 773 | gas | O ₂ | Cu–ZSM-5 | 1.00E+00 | | | 0.00E+00 | | | 0.00E+00 |
| Procedia Chemistry 14 (2015) 508 – 515 | BR | 423 | gas | | Hi Co/ZSM-5 | | | | | 4.20E-01 | | |
| Ionics (2014) 20:445–449 | FBR | 298 | gas | O ₂ | Ga/CZA (3%-Ga over Al ₂ O ₃) | 2.20E-01 | | 2.30E-01 | 1.20E-01 | 5.45E+01 | | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 573 | gas | N ₂ O | FeZSM-5 | 1.90E-02 | | 1.20E-01 | 6.00E-02 | 3.60E-02 | 3.05E-05 | 0.00E+00 |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|-------------------------------------|---------------------|---------|--------|-------------------------------|---|------------------------|-----------------------|----------|----------------------|----------------------|---|--|
| J. Catal. 318 (2014) 14–21 | FBR | 573 | gas | N ₂ O | FeZSM-5 | 9.30E-02 | | 2.90E-01 | 7.50E-02 | 1.90E-02 | 7.88E-05 | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 573 | gas | N ₂ O | FeZSM-5 | 1.90E-01 | | 3.20E-01 | 7.50E-02 | 1.30E-02 | 1.10E-04 | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 573 | gas | N ₂ O | FeZSM-5 | 4.20E-01 | | 4.50E-01 | 4.50E-02 | 7.50E-03 | 1.40E-04 | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 548 | gas | N ₂ O | FeZSM-5 | 2.70E-02 | | 9.30E-02 | 4.00E-02 | 2.20E-02 | 2.65E-05 | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 548 | gas | N ₂ O | FeZSM-5 | 3.10E-01 | | 3.30E-01 | 6.00E-02 | 6.50E-03 | 8.98E-05 | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 548 | gas | N ₂ O | FeZSM-5 | 5.70E-01 | | 3.20E-01 | 5.00E-02 | 2.70E-03 | 6.86E-05 | 0.00E+00 |
| J. Catal. 318 (2014) 14–21 | FBR | 548 | gas | N ₂ O | FeZSM-5 | 6.20E-01 | | 3.20E-01 | 3.00E-02 | 1.90E-03 | 5.25E-05 | 0.00E+00 |
| Langmuir 2014, 30, 8558–8569 | FBR | 448 | gas | O ₂ | Ni-ZSM5 | | | | | | 2.47E-04 | |
| Catal. Commun. 58 (2015) 200–203 | CSTR / photocat. | 328 | liquid | | WO ₃ | | | | | | 5.33E-04 | |
| Appl. Catal. B 163 (2015) 150–155 | CSTR / photocat. | 328 | liquid | | WO ₃ /Fe ³⁺ | 3.74E-01 | | | 5.89E-01 | 1.23E-02 | 1.78E-03 | 0.00E+00 |
| Appl. Catal. B 163 (2015) 150–155 | CSTR / photocat. | 328 | liquid | | WO ₃ /Fe ³⁺ | 5.85E-01 | | | 3.75E-01 | 9.58E-03 | 2.16E-03 | 0.00E+00 |
| Catal. Sci. Technol., 2015, 5, 4108 | BR | 313 | liquid | H ₂ O ₂ | trimetallic copper complex/HNO ₃ | 1.90E-02 | | | 9.81E-01 | | | 0.00E+00 |
| Catal. Sci. Technol., 2015, 5, 4108 | BR | 313 | liquid | H ₂ O ₂ | Cu(NO ₃) ₂ /HNO ₃ | 1.29E-02 | | | 9.87E-01 | | | 0.00E+00 |
| Chem. Commun., 2015, 51, 7249–7252 | CSTR / photocat. | 328 | liquid | | Bi ₂ WO ₆ | 6.00E-02 | | | | 1.60E-02 | 1.23E-03 | |
| Chem. Commun., 2015, 51, 7249–7252 | CSTR / photocat. | 328 | liquid | | Bi ₂ WO ₆ | 2.80E-01 | | | | 1.40E-02 | 5.02E-03 | |
| Chem. Commun., 2015, 51, 7249–7252 | CSTR / photocat. | 328 | liquid | | Bi ₂ WO ₆ + NaNO ₃ | 4.00E-02 | | | | 9.90E-02 | 5.07E-03 | |
| Chem. Commun., 2015, 51, 7249–7252 | CSTR / photocat. | 328 | liquid | | Bi ₂ WO ₆ + NaNO ₃ | 1.10E-01 | | | | 4.50E-02 | 6.34E-03 | |
| RSC Adv., 2015, 5, 69509 | FBR | 823-963 | gas | O ₂ | VOx/Ti-SBA-15 | | 4.70E-01 | | | 1.00E-02 | | 1.20E+00 |
| RSC Adv., 2015, 5, 69510 | FBR | 823-963 | gas | O ₂ | VOx/Ti-SBA-15 | | 4.00E-01 | | | 2.00E-02 | | 2.10E+00 |
| RSC Adv., 2015, 5, 69511 | FBR | 823-963 | gas | O ₂ | VOx/Ti-SBA-15 | | 3.00E-01 | | | 3.00E-02 | | 2.30E+00 |
| RSC Adv., 2015, 5, 69512 | FBR | 823-963 | gas | O ₂ | VOx/Ti-SBA-15 | | 2.50E-01 | | | 4.00E-02 | | 2.60E+00 |
| RSC Adv., 2015, 5, 69513 | FBR | 823-963 | gas | O ₂ | VOx/Ti-SBA-15 | | 2.00E-01 | | | 5.00E-02 | | 2.60E+00 |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | H-ZSM-5 | | | | | | 5.20E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | H-Beta | | | | | | 2.40E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | MCM-41 | | | | | | 6.00E-04 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | H-ZSM-5 | | | | | | 6.00E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | H-mordenite | | | | | | 4.60E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | H-ferrierite | | | | | | 2.70E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | Na-ZSM-5 | 7.06E-01 | | | | only byproduct | 2.20E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | Na-Y | | | | | | 3.00E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | Na-SAPO-34 | | | | | | 7.90E-03 | |
| ACS Cent. Sci. 2016, 2, 424–429 | FBR | 483 | gas | O ₂ | Na-SSZ-13 | | | | | | 6.10E-03 | |
| Catal. Sci. Technol., 2016, 6, 3410 | BR | 323 | liquid | H ₂ O ₂ | 2.5% Au 2.5% Pd/TiO ₂ | 6.82E-01 | | | 1.67E-01 | | | |
| Catal. Sci. Technol., 2016, 6, 3410 | BR | 323 | liquid | H ₂ O ₂ | 2.5% Au 2.5% Pd 2.5% Cu/TiO ₂ | 8.18E-01 | | | 1.82E-01 | | | |
| Catal. Sci. Technol., 2016, 6, 3410 | BR | 323 | liquid | H ₂ O ₂ | 2.5% Au 2.5% Pd 1.0% Cu/TiO ₂ | 7.50E+01 | | | 2.50E-01 | | | |

Table S2: Database with catalyst composition and their performance in methane oxidation to oxygenates under different reaction conditions.

| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg kg _{Cat} ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg kg _{Cat} ⁻¹ h ⁻¹] |
|--|---------|-------|--------|---|---|------------------------|-----------------------|--------|----------------------|----------------------|---|--|
| Catal. Sci. Technol., 2016, 6, 3410 | BR | 323 | liquid | H ₂ O ₂ | 2.5% Au 2.5% Pd 0.5% Cu/TiO ₂ | 6.08E-01 | | | 3.92E-01 | | | |
| Catal. Sci. Technol., 2016, 6, 3410 | BR | 323 | liquid | H ₂ O ₂ | Au 2.5% Pd/TiO ₂ 2.5%Cu/TiO ₂ | 8.31E-01 | | | 1.69E-01 | | | |
| Catal. Today 270 (2016) 93–100 | FRB | 323 | gas | H ₂ O ₂ | 1.5% Fe 1.5% Cu/ZSM-5 | 9.20E-01 | | | 7.80E-02 | 5.00E-03 | 2.59E-03 | |
| Reference | Reactor | T / K | Phase | Oxidant | Catalyst | S (CH ₃ OH) | S (CH ₂ O) | S (CO) | S (CO ₂) | X (CH ₄) | STY (CH ₃ OH) [kg L ⁻¹ h ⁻¹] | STY (CH ₂ O) [kg L ⁻¹ h ⁻¹] |
| Science, 1993, 259, 340-343 | BR | 453 | liquid | H ₂ SO ₄ | Hg(CF ₃ SO ₃) ₂ | 0.85 | 0.85 | | | 0.5 | 1.15E-02 | |
| J.Am.Chem. Soc., 1996, 118, 4574-4580 | BR | 353 | liquid | O ₂ | RhCl ₃ *3H ₂ O (bpym)PtCl ₂ - Periana-Catalytica | | | | | | 3.73E-04 | |
| Science, 1998, 280, 560-564 | BR | 493 | liquid | H ₂ SO ₄ | (bpym)PtCl ₂ - Periana-Catalytica | 0.81 | 0.81 | | | 0.9 | 1.15E-01 | 6.00E-07 |
| Chem. Comm., 2000, 1131-1132 | BR | 353 | liquid | H ₂ O ₂ | OsCl ₃ | 0.998 | 0.002 | | | | 3.63E-04 | 6.00E-07 |
| J. Catal. 2000, 196, 287-292 | BR | 453 | liquid | SO ₃ | HgSO ₄ | | | | | | 3.88E-04 | |
| Chem. Commun. 2002, 2376-2377 | BR | 468 | liquid | SO ₃ | I ₂ | 0.95 | | | | 0.31 | | |
| J. Catal. 2003, 215, 14-19 | BR | 433 | liquid | SO ₃ | Pd | 0.59 | | | 0.41 | 0.15 | 2.57E-03 | |
| Science 2003, 301, 814-818 | BR | 453 | liquid | | PdSO ₄ | 0.89 | | | | | | |
| Applied Catal. A 2004, 261, 91-98 | BR | 453 | liquid | SO ₃ | I ₂ | 0.92 | | | 0.05 | 0.35 | | |
| Applied Catal. A 2006, 307, 270-274 | BR | 453 | liquid | SO ₃ | PtCl ₄ | | | | | | 6.72E-03 | |
| J. Am. Chem. Soc. 2006, 128, 16028-16029 | BR | 353 | liquid | O ₂ | Pd ²⁺ /Pd ⁰ , Q/H ₂ Q, and NO ₂ /NO in CF ₃ COOH | | | | | | 1.31E-04 | |
| Catal. Today 140 (2009) 157–161 | BR | 453 | liquid | O ₂ | Mn ₂ O ₃ | 0.95 | | | | 0.36 | 4.84E-04 | |
| I&ECResearch, 2011, 50, 6513-6516 | BR | 353 | liquid | O ₂ | Pd(OAc) ₂ /BQ/H ₅ PMo ₁₀ V ₂ O ₄₀ | 0.89 | | | | | 1.12E-04 | |
| Applied Catal. A 2011, 394, 266-268 | BCR | 403 | liquid | SO ₃ | I ₂ | | | | | | 1.23E-05 | |
| Catal. Lett. 2013, 143, 610-615 | BR | 393 | liquid | O ₂ | PdCl ₂ (bpy)/BQ/H ₅ PMo ₁₀ V ₂ O ₄₀ | | | | | | 1.72E-05 | |
| Catal. Lett. 2013, 143, 126-129 | BR | 353 | liquid | O ₂ | K ₂ PdCl ₄ / H ₅ PMo ₁₀ V ₂ O ₄₀ | 0.16 | | | | 0.04 | 1.62E-04 | |
| Eur. J. Inorg. Chem. 2013, 3659–3663 | BR | 453 | liquid | O ₂ | Co ^{II} /Co ^{III} | | | | | | 1.35E-03 | |
| Science 2014, 343, 1232-1237 | BR | 453 | liquid | Tl(TFA) ₃ | | 1 | | | | 0.74 | 1.97E-03 | |
| Science 2014, 343, 1232-1237 | BR | 453 | liquid | Pb(TFA) ₄ | | 1 | | | | 0.76 | 2.02E-03 | |
| Dalton Trans. 2015, 44, 5294-5298 | BR | 473 | liquid | | KIO ₄ / KCl | 0.42 | | | | | | |
| J. Am. Chem. Soc. 2016, 138, 12395-12400 | BR | 488 | liquid | H ₂ SO ₄ +SO ₃ | K ₂ PtCl ₄ | 0.99 | | | | 0.26 | 5.01E-01 | |