

Supplementary Information

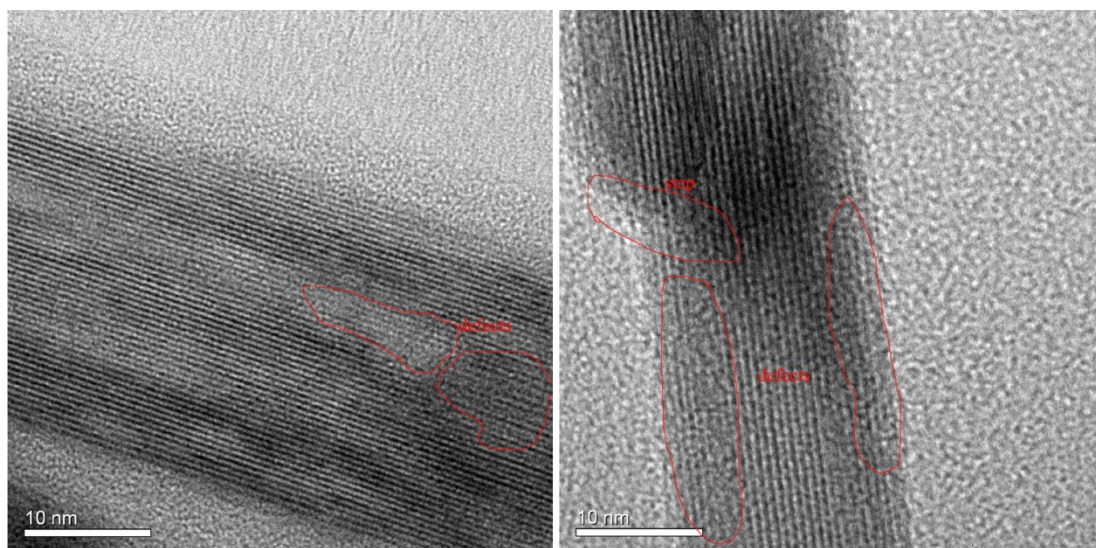


Fig. S1 HRTEM images of HAc-OMS-2

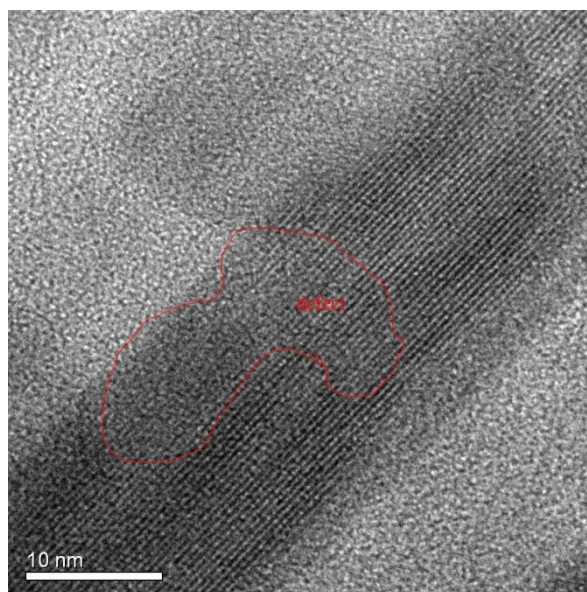


Fig. S2 HRTEM image of HCl-OMS-2

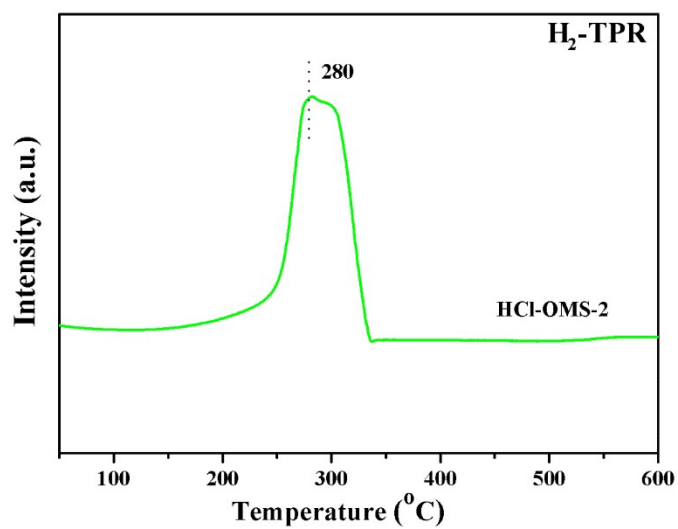


Fig. S3 H₂-TPR profile of HCl-OMS-2

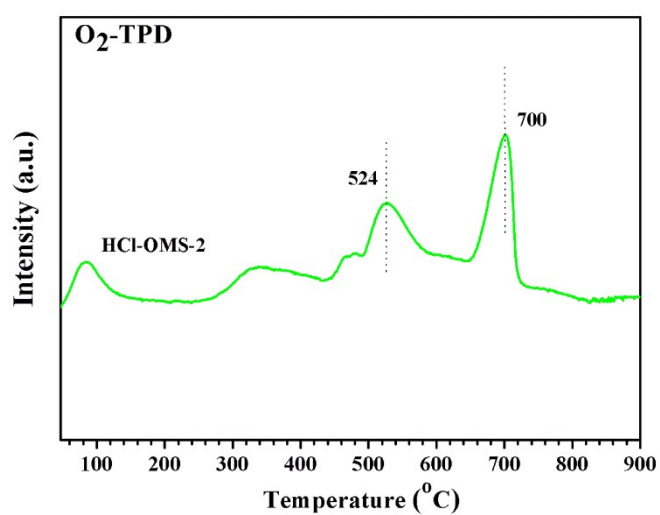


Fig. S4 O₂-TPD profile of HCl-OMS-2

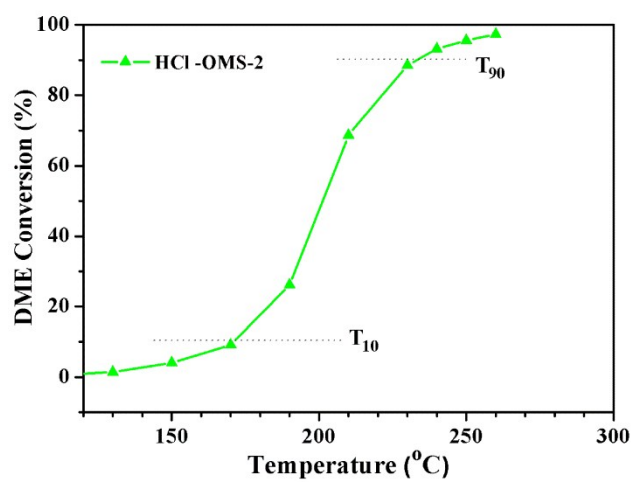


Fig.S5 DME combustion activity of HCl-OMS-2

Table S1 The reported DME combustion performance in recent 5 years

Catalyst	T ₁₀ /°C	T ₉₀ /°C	Reference
HAc-OMS-2	170	230	Our work
α -MnO ₂ @ γ -MnO ₂	171	220	1
LaMnO ₃	210	295	2
CoFe ₂ O ₄	ca.300	ca.410	3
Zn _{0.8} Mn _{0.2} Fe _{2.4} O ₄	257	276	4
Cu-OMS-2	171	180	5
2PtAl	106	ca.310	6

Reference 1 :

1. B. Zhang, G. Cheng, W. Ye, X. Zheng, H. Liu, M. Sun, L. Yu, Y. Zheng and X. Cheng, *Dalton Trans*, 2016, **45**, 8.
2. R. Dinamarca, C. Sepúlveda, E. J. Delgado, O. Peña, J. L. G. Fierro and G. Pecchi, *Journal of Catalysis*, 2016, **338**, 47-55.
3. Z.-Y. Tian, P. Mountapmbeme Kouotou, A. El Kasmi, P. H. Tchoua Ngamou, K. Kohse-Höinghaus, H. Vieker, A. Beyer and A. Götzhäuser, *Proceedings of the Combustion Institute*, 2015, **35**, 2207-2214.
4. Z. Beji, M. Sun, L. S. Smiri, F. Herbst, C. Mangeney and S. Ammar, *RSC Advances*, 2015, **5**, 65010-65022.
5. M. Sun, L. Yu, F. Ye, G. Q. Diao, Q. Yu, Z. F. Hao, Y. Y. Zheng and L. X. Yuan, *Chem. Eng. J.*, 2013, **220**, 320-327.
6. S. Colussi, A. Gayen, J. Llorca, C. de Leitenburg, G. Dolcetti and A. Trovarelli, *Industrial & Engineering Chemistry Research*, 2012, **51**, 7510-7517.

Table S2 Some of the reported metal oxide catalysts for toluene combustion

Catalyst	T ₁₀ /°C	T ₉₀ /°C	Reference
HAc-OMS-2	170	194	Our work
NiO	212	266	7
Porous MnO ₂	ca.130	217	8
ϵ -MnO ₂	ca.170	229	9
α -MnO ₂	210	225	10

Co ₃ O ₄	110	215	11
Ag-Mn/SBA-15	ca.220	ca.255	12
Au-β-MnO ₂	170	220	13
Au/Ce _{0.6} Zr _{0.3} Y _{0.1} O ₂	218	265	14
0.13Ag/Mn ₂ O ₃	110	215	15
γ-MnO ₂	<200	252	16
α-MnO ₂	214	237	17

Reference II :

7. G. Bai, H. Dai, J. Deng, Y. Liu and K. Ji, *Catal. Commun.*, 2012, **27**, 148-153.
8. Y. Du, Q. Meng, J. Wang, J. Yan, H. Fan, Y. Liu and H. Dai, *Microporous Mesoporous Mater.*, 2012, **162**, 199-206.
9. F. Shi, F. Wang, H. Dai, J. Dai, J. Deng, Y. Liu, G. Bai, K. Ji and C. T. Au, *Appl. Catal., A*, 2012, **433-434**, 206-213.
10. F. Wang, H. Dai, J. Deng, G. Bai, K. Ji and Y. Liu, *Environ Sci Technol*, 2012, **46**, 4034-4041.
11. G. Bai, H. Dai, J. Deng, Y. Liu, F. Wang, Z. Zhao, W. Qiu and C. T. Au, *Appl. Catal., A*, 2013, **450**, 42-49.
12. Z. Qu, Y. Bu, Y. Qin, Y. Wang and Q. Fu, *Appl. Catal., B*, 2013, **132-133**, 353-362.
13. Q. Ye, J. Zhao, F. Huo, D. Wang, S. Cheng, T. Kang and H. Dai, *Microporous Mesoporous Mater.*, 2013, **172**, 20-29.
14. W. Tan, G. Guo, J. Deng, S. Xie, H. Yang, Y. Jiang and H. Dai, *Industrial & Engineering Chemistry Research*, 2014, **53**, 18452-18461.
15. J. Deng, S. He, S. Xie, H. Yang, Y. Liu, G. Guo and H. Dai, *Environmental Science & Technology*, 2015, **49**, 11089-11095.
16. W. Si, Y. Wang, Y. Peng, X. Li, K. Li and J. Li, *Chem Commun (Camb)*, 2015, **51**, 14977-14980.
17. G. Cheng, L. Yu, B. Lan, M. Sun, T. Lin, Z. Fu, X. Su, M. Qiu, C. Guo and B. Xu, *Mater. Res. Bull.*, 2016, **75**, 17-24.