

Supporting Information

Hierarchical flower-like hollow alumina supported bimetallic AuPd nanoparticle catalyst for the enhanced solvent-free ethylbenzene oxidation

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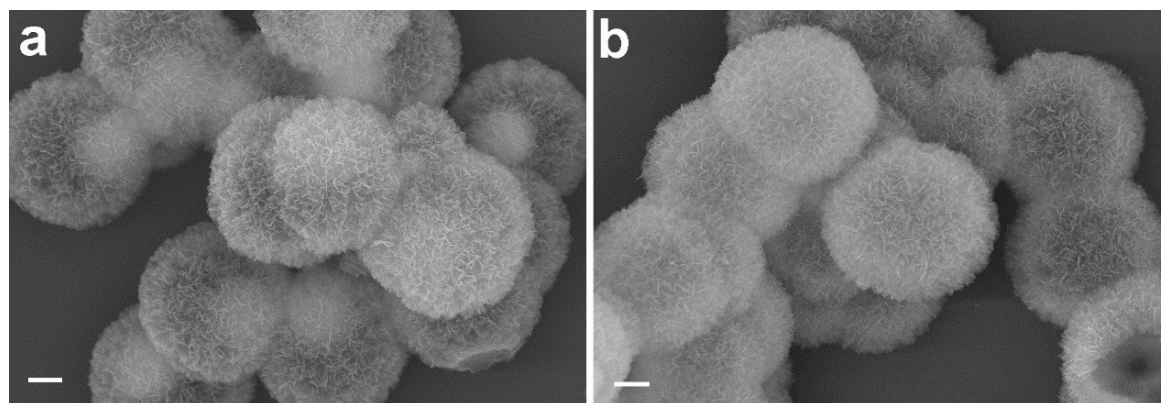


Fig.S1 SEM images of Au/MHAM (a) and Pd/MHAM (b) samples. The bar scale is 1.0 μ m.

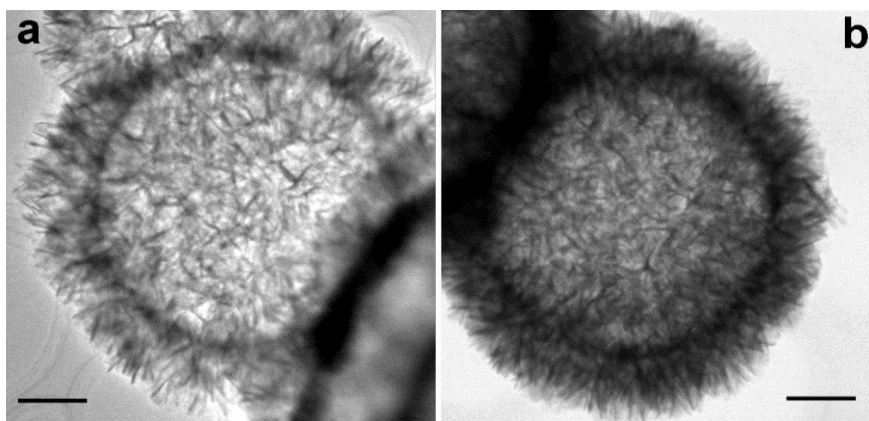


Fig.S2 TEM images of Au/MHAM(a) and Pd/MHAM(b) samples. The bar scale is 1.0 μ m.

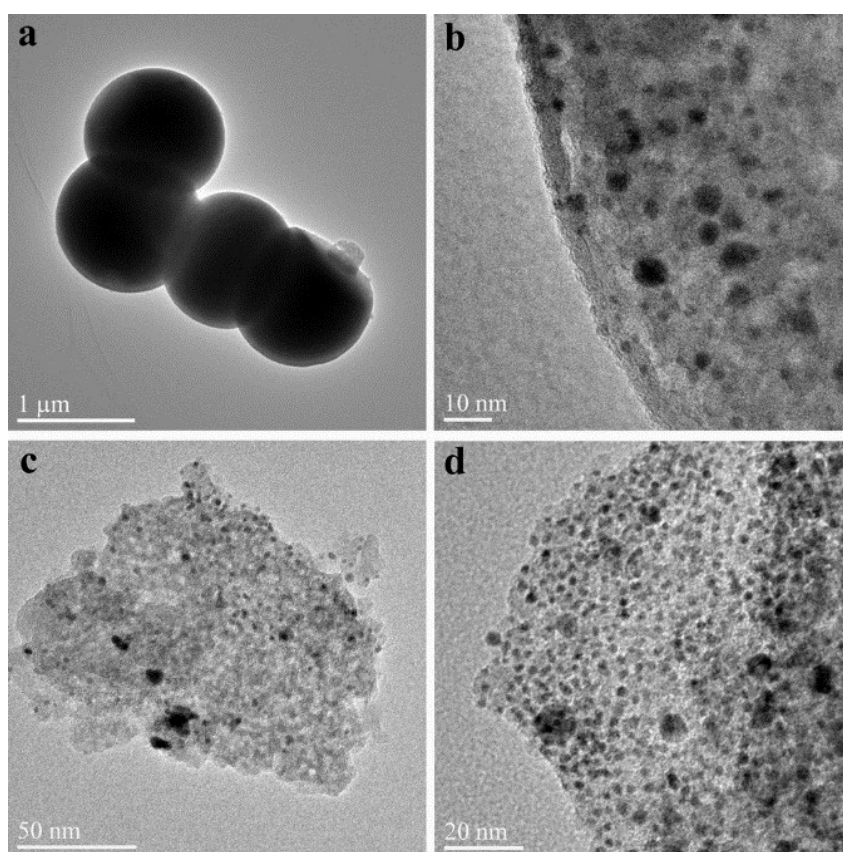


Fig.S3 TEM and HRTEM images of AuPd/S-Al₂O₃ (a and b) and AuPd/C-Al₂O₃ (c and d).

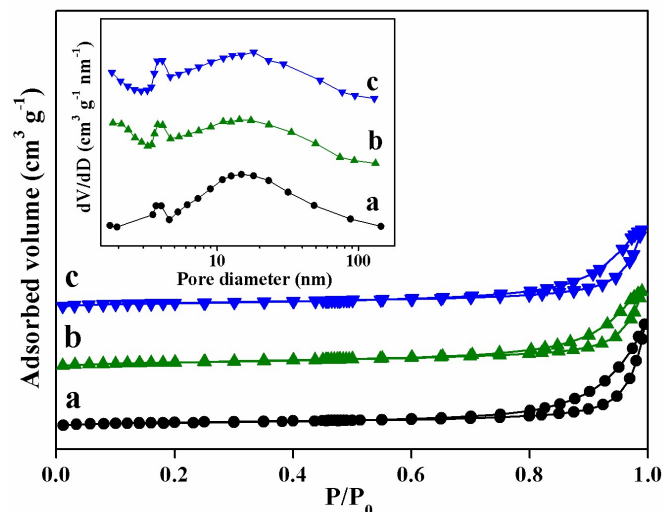


Fig.S4 Low-temperature N₂ adsorption-desorption isotherms of Au/MHAM (a), AuPd/MHAM (b) and Pd/MHAM (c) samples. The inset shows the pore size distributions of samples.

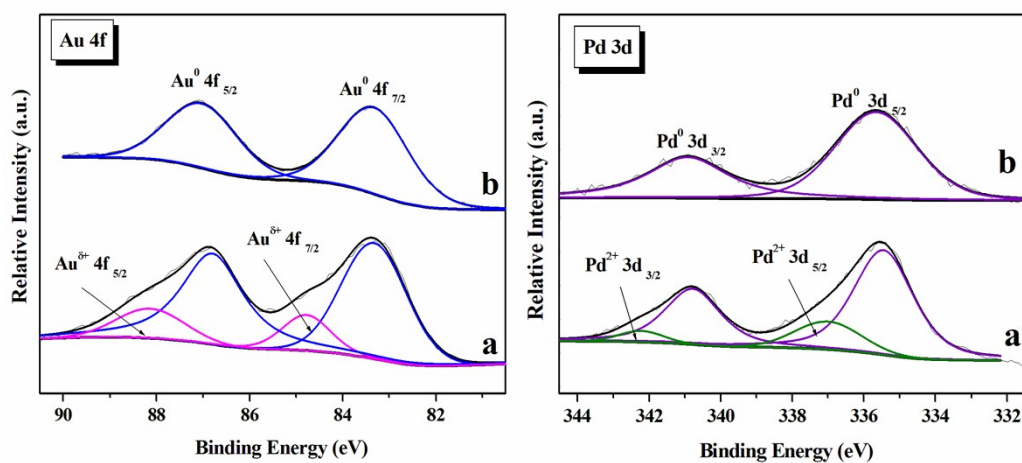


Fig.S5 XPS of Au 4f and Pd 3d regions for AuPd/S-Al₂O₃ (a) and AuPd/C-Al₂O₃ (b) samples.

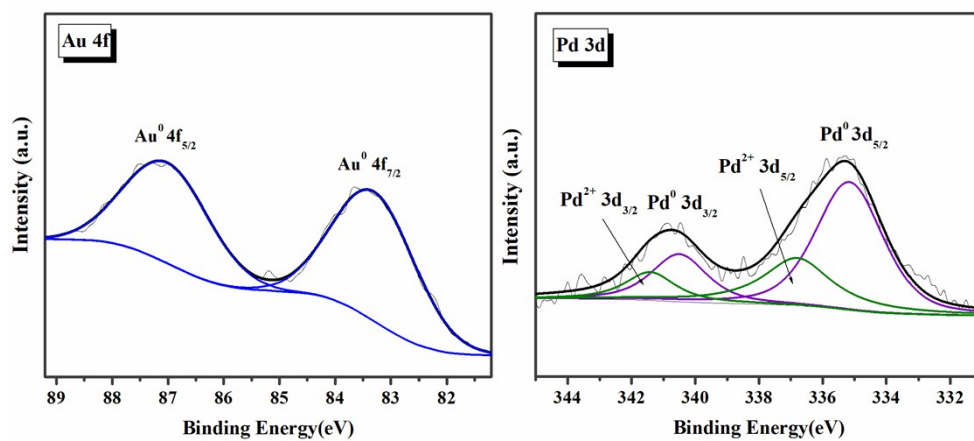


Fig.S6 XPS of Au 4f and Pd 3d regions for AuPd/MHAM sample pre-treated at 200 °C at air for 30 min.

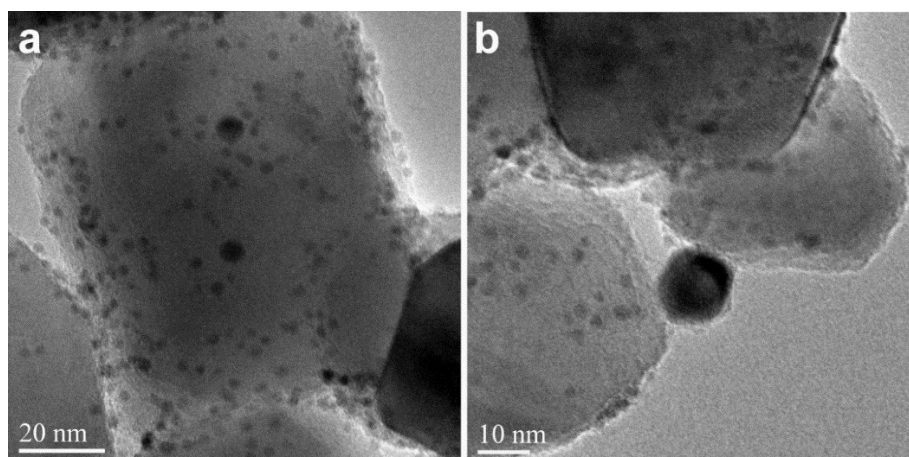


Fig.S7 TEM images of AuPd/TiO₂ sample (a and b).

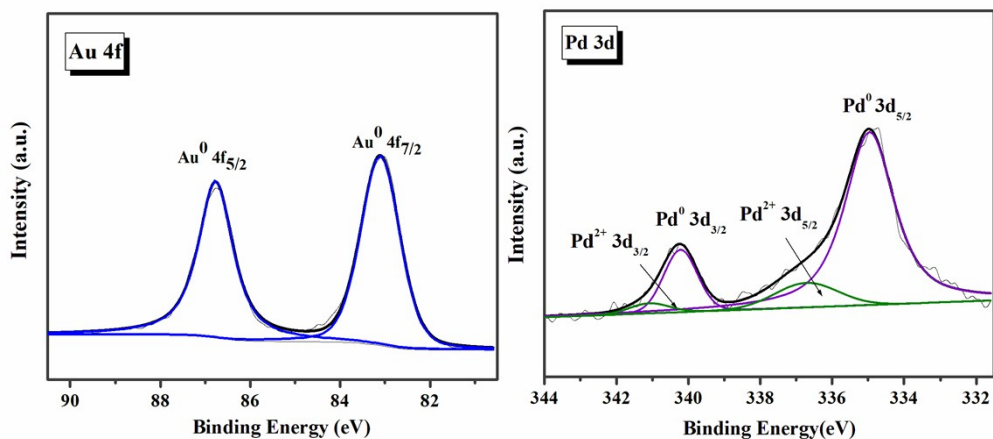


Fig.S8 XPS of Au 4f and Pd 3d regions for AuPd/TiO₂ sample.

Table S1 Catalytic performances of other catalysts in the EB oxidation.

| Catalyst | Time (h) | Temp. (°C) | P _{O2} (MPa) | solvent | Conv. (%) | Selec.to AP (%) | TON (mol/mol) | Ref. |
|---|----------|------------|-----------------------|--------------------|-----------|-----------------|---------------|-----------|
| Au/TiO ₂ | 24 | 90 | 1.0 atm | --- | 26.0 | 85.0 | 910 | [28] |
| Au-Pd/MIL-101 | 4 | 150 | 1.5 | CH ₃ CN | 38.5 | 65.3 | 3850 | [41] |
| Ce _{0.5} Mn _{0.5} O _x ^a | 6 | 120 | 1.0 | CH ₃ CN | 20.3 | 87.0 | -- | [55] |
| Mn(OH) _x /γ-Al ₂ O ₃ | 9 | 135 | 5 ml/min | BA ^d | 61.0 | 84.0 | 813 | [56] |
| MnO _x /HTS ^b | 1 | 120 | 1.0 | -- | 37.1 | 68.6 | 137.3 | [57] |
| Co-N-C/CeO ₂ | 5 | 120 | 0.8 | -- | 33.1 | 74.8 | -- | [58] |
| Co-N-C/g-C ₃ N ₄ | 5 | 120 | 0.8 | -- | 28.0 | 78.1 | -- | [59] |
| AuPd/MHAM | 12 | 120 | 1.0 | -- | 54.2 | 93.7 | 27433 | This work |
| AuPd/MHAM | 6 | 120 | 1.0 | -- | 38.1 | 85.4 | 20534 | This work |
| AuPd/MHAM | 1 | 120 | 1.0 | -- | 19.1 | 73.3 | 10294 | This work |

^a Ce-Mn-Ox solid solution; ^b HTS: Hollow Titanosilicate molecular sieve TS-1; ^c containing TBHP (2 ml); ^d Benzoic acid.