Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information for the manuscript

A facile and green approach to synthesize Pt@CeO_2 nanocomposite with tunable core-shell and yolk-shell structure and its application as a visible light photocatalyst

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Method for calculation procedures for energy position of conduction band edge (E_c) and valence band edge (E_v) of semiconductors

The calculation can be described as the following steps.

1. Calculate electronegativity of the elements[S1]

$$\chi = \frac{I + A}{2}$$

where χ is electronegativity; I is ionization energy and A is electron affinity.

2. Calculate electronegativity of the compound M_mO_n [S2,S3]

$$\chi_{oxide} = [(\chi_M)^m (\chi_O)^n]^{1/(m+n)}$$

3. Calculate the Eg (band gap) from DRS (UV-visible diffuse reflectance spectra) result[S4]

$$E_g = \frac{1240}{\lambda}$$

4. Determine E_c and E_v [S5]

vs. AVS (the absolute vacuum scale)

$$E_C = -\chi + 0.5E_g$$

$$E_V = -\chi - 0.5E_g$$

vs. SHE (standard hydrogen electrode)

$$E_C = -\chi + 0.5E_g - 4.5$$

$$E_V = -\chi - 0.5E_g - 4.5$$

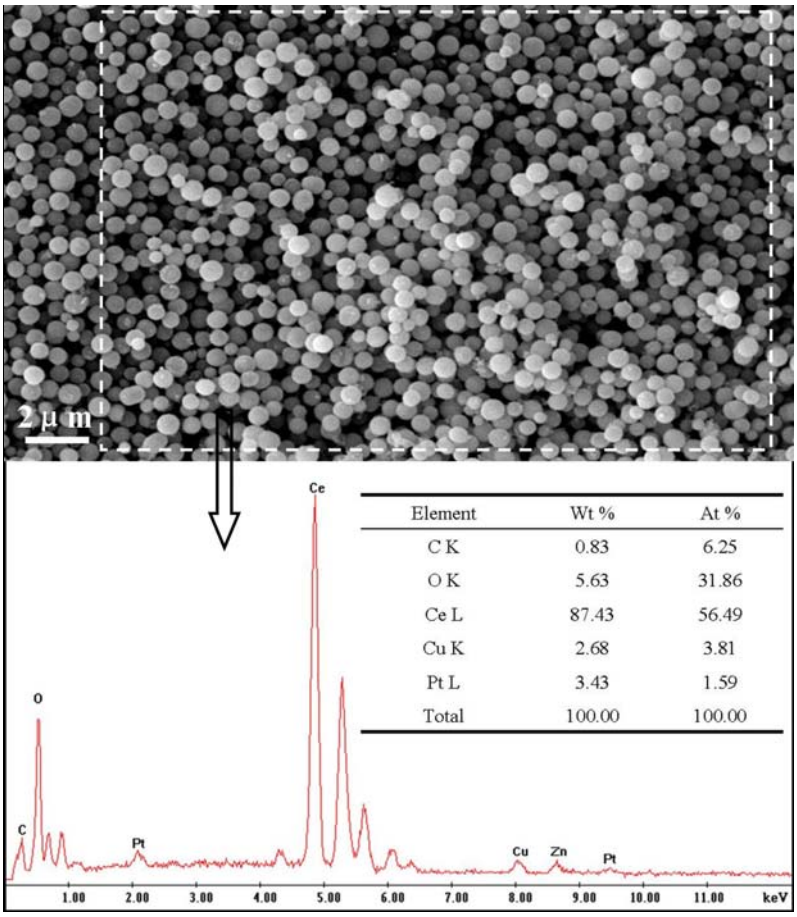
(S1) R. P. Iczkowski and J. L. Margrave, *J. Am. Chem. Soc.,* 1961, **83**, 3547.

(S2) R. T. Poole, D. R. Williams, J. D. Riley, J. G. Jenkin, J. Liesegang and R. C. G. Leckey, *Chem. Phys. Lett.,* 1975, **36**, 401.

(S3) J. Portier, P. Poizot, G. Campet, M. A. Subramanian and J. M. Tarascon, *Solid State Sci.,* 2003, **5**, 695.

(S4) A. Mylonas, A. Hiskia, E. Androulaki, D. Dimotikali and E. Papaconstantinou, *Phys. Chem. Chem. Phys.* 1999, **1**, 437.

(S5) Y. Xu and M. A. A. Schoonen, *Am. Mineral.* 2000, **85**, 543.



Element	Wt %	At %
C K	0.83	6.25
O K	5.63	31.86
Ce L	87.43	56.49
Cu K	2.68	3.81
Pt L	3.43	1.59
Total	100.00	100.00

Fig. S1 The result of EDS for the core-shell Pt@CeO_2 nanoparticles (note: the singals of Cu and Zn resulted from the sample holder).

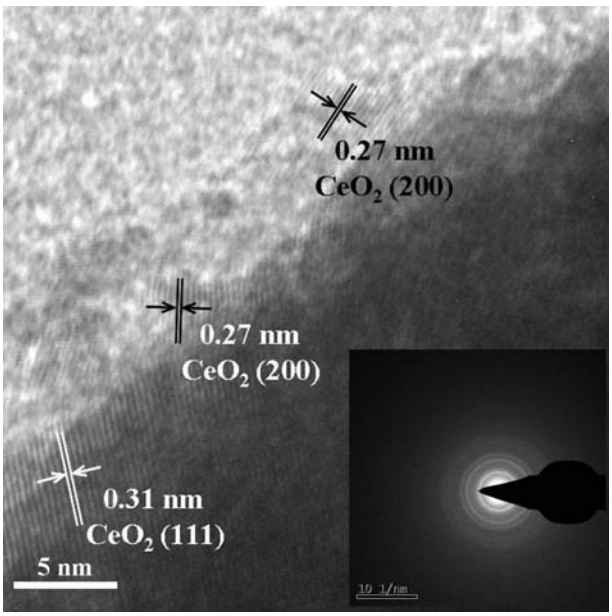


Fig. S2 HRTEM and SAED images of the yolk-shell Pt@CeO_2 nanocomposite.

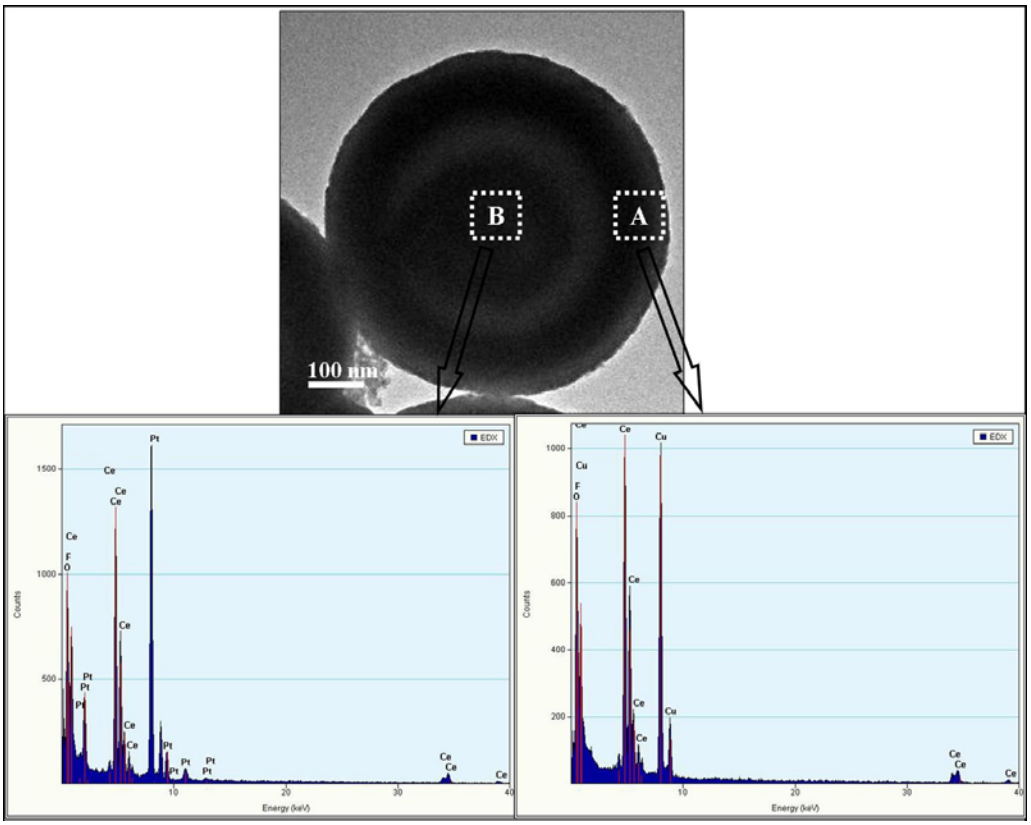


Fig. S3 TEM and EDS results of the as-synthesized yolk-shell Pt@CeO_2 nanocomposite (note: the singal of Cu resulted from the sample holder).

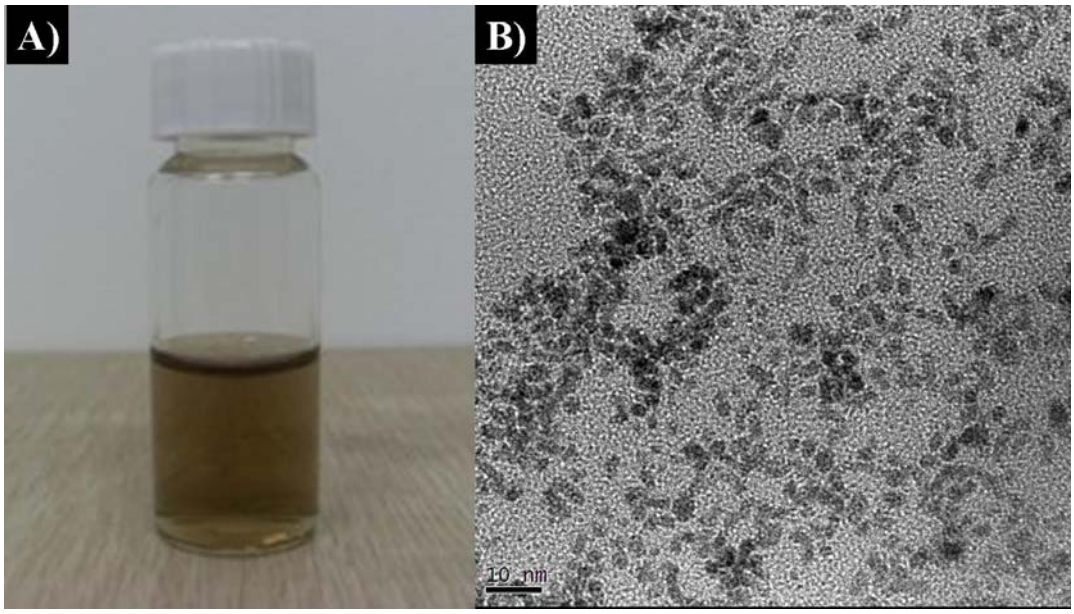


Fig. S4 Photograph (A) and TEM image (B) of the original Pt colloid nanoparticles.

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