## **Supplementary Material**

## Long Chain Ionic Liquid-Assisted Synthesis of PS/Pd Beads and Double Porous Pd-SiO<sub>2</sub>

Tianlong Wang,<sup>a,b</sup> Ting Fu,<sup>a,b</sup> Yuting Meng,<sup>a,b</sup> Jing Shen,<sup>\*a</sup> and Tongwen Wang,<sup>a,b</sup>

<sup>a</sup>Department of Applied Chemistry, College of Vocational Education, and <sup>b</sup>College of Chemistry and Chemical Engineering, Yunnan Normal University, Kunming 650092, China. E-mail: shenjingbox0225@hotmail.com



Fig. S1 IR spectrum of 1-hexadecyl-3-methylimidazolium chloride (C<sub>16</sub>mimCl).

Fig. S1 presents IR spectrum of the synthesized  $C_{16}$ mimCl between 400 and 4000 cm<sup>-1</sup>. The bands at 3471 cm<sup>-1</sup> and 3412 cm<sup>-1</sup> can be attributed to the antisymmetric  $v_3$  and symmetric  $v_1$  stretching modes of water, where the water interacts with the anion via H-bonding in a symmetric complex Cl<sup>-</sup>···H–O–H···Cl<sup>-</sup>(ref. L. Cammarata, S. G. Kazarin, P. A. Salter and T. Welton, *Phys. Chem. Chem. Phys.* 2001, **3**, 5192.). Next to that, the two characteristic bands around 3155 cm<sup>-1</sup> and 3142 cm<sup>-1</sup>, which can be assigned to the symmetric  $v_s$  CH(4, 5) and asymmetric  $v_{as}$  CH(4, 5) stretch of in positions four and five of the imidazolium ring (ref. B. D. Fitchett, J. C. Conboy, *J. Phys. Chem.* 2004, **108**, 20255.). The peaks around 3060 cm<sup>-1</sup>

are contribution from the asymmetric stretching  $v_{as}$  N-CH<sub>3</sub> of the methyl group bound to the imidazolium ring. The next strong bands at 2915 cm<sup>-1</sup> and 2853 cm<sup>-1</sup> can be assigned to the antisymmetric  $v_{as}$  CH<sub>2</sub> and symmetric  $v_s$  CH<sub>2</sub> stretching modes of the alkyl chain. The analysis of other vibration mode assignment can be seen in our early work.<sup>15</sup> Therefore, the results allow conclusion that the C<sub>16</sub>mimCl with imidazolium ring and alkyl chain was synthesized.



Fig. S2 (A) SEM image of uncoated PS microshperes. (B) is local enlarged position of (A).



**Fig. S3** TEM images of (A) Pd-SiO<sub>2</sub>(18%), (B) an enlarged local view of (A), and (C) the local border of the sample.



Fig. S4 Small-angle XRD pattern of  $Pd-SiO_2(18\%)$  prepared using using  $PS/C_{16}mimCl/Pd(18\%)$  beads and  $C_{16}mimCl$  as dual templates.



Fig. S5 Plots of  $A/A_0$  against time for the oxidation reactions of TMB by  $H_2O_2$  without and with Pd-SiO<sub>2</sub>(12%) or Pd-SiO<sub>2</sub>(18%) (A and  $A_0$  are absorbance at time t and absorbance at the initial stage)