

Supporting Information

Synthesis of well-defined silica and Pd/silica nanotubes through surface sol-gel process on self-assembled chelate block copolymer

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^1H NMR analysis (Figure S1)

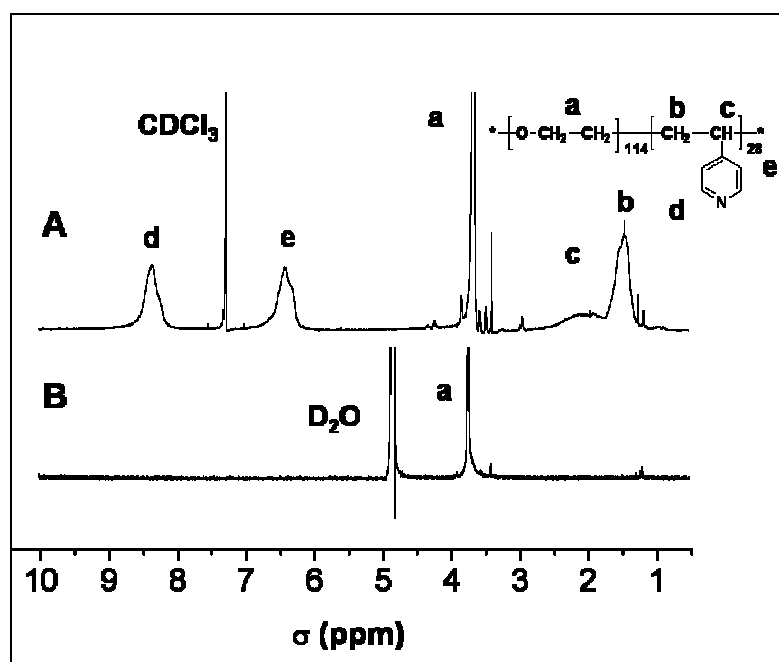


Figure S1. ^1H NMR spectra of $\text{PEG}_{114}\text{-}b\text{-P4VP}_{28}$ in CDCl_3 and D_2O .

Figure S1A shows the ^1H NMR spectra of the block copolymer $\text{PEG}_{114}\text{-}b\text{-P4VP}_{28}$ in CDCl_3 at room temperature. Clearly, all characteristic ^1H NMR signals of the PEG

(peak *a* at $\delta = 3.6$) and P4VP block (peaks *b* and *c* at $\delta = 1.4-2.1$, and *d* and *e* at $\delta = 6.3-8.3$) can be clearly observed. This means that the block copolymer exists as single chains in CDCl_3 since CDCl_3 is a good solvent of the block copolymer. Compared with Figure S1A, the distinctness of the ^1H NMR spectra shown in Figure S1B is that the peaks *b*, *c*, *d* and *e* corresponding to the P4VP block disappear. This suggests that the block copolymer $\text{PEG}_{114}\text{-}b\text{-P4VP}_{28}$ self-assembles into core-corona micelles with the P4VP block as core and PEG block as corona in water at room temperature.¹

TEM observation (Figure S2)

Figure S2 shows the TEM image of the resultant irregular aggregates from the sol-gel polymerization when the NH_3 aqueous solution was added into the micelles aqueous dispersion.

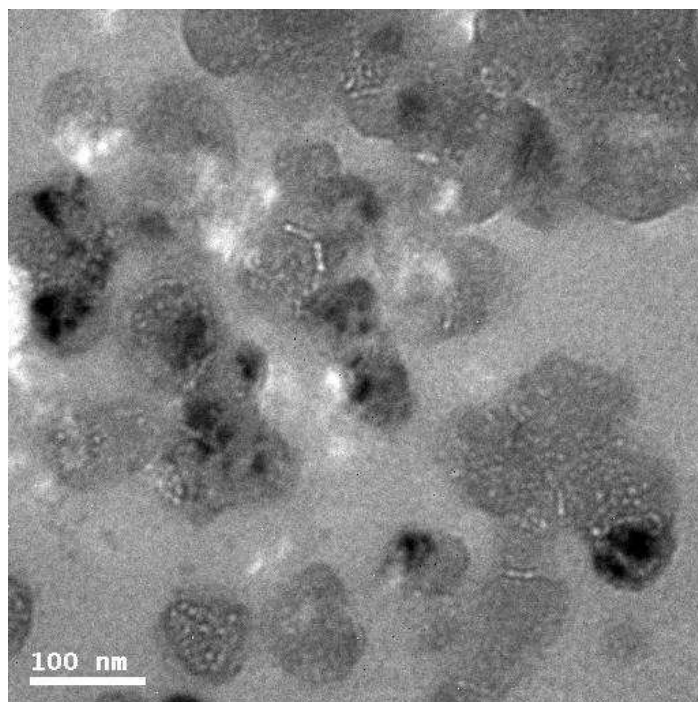


Figure S2. TEM image of the irregular aggregates.

XRD analysis (Figure S3~S4)

Figure S3 shows the XRD pattern of the Pd/silica nanotubes following Method 1.

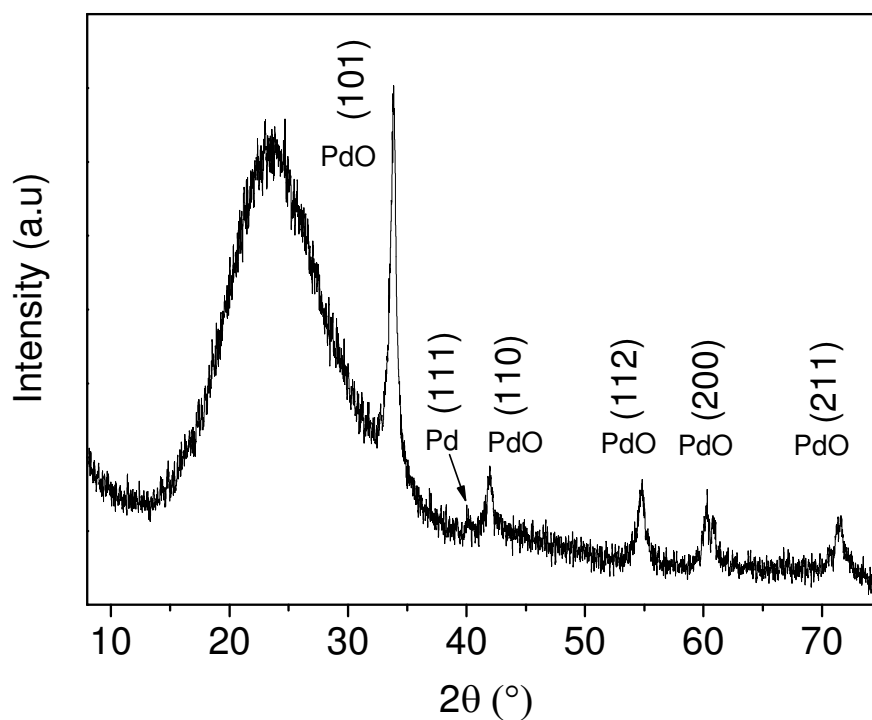


Figure S3. The XRD pattern of the silica-coated Pd/silica nanotubes following Method 1.

Figure S4 shows the XRD pattern of the silica and Pd/silica nanotubes following Method 2. From the (101) lattice plane, the size of PdO nanoparticles encapsulated within the cavum of the silica nanotubes is calculated to be 12.6 nm.

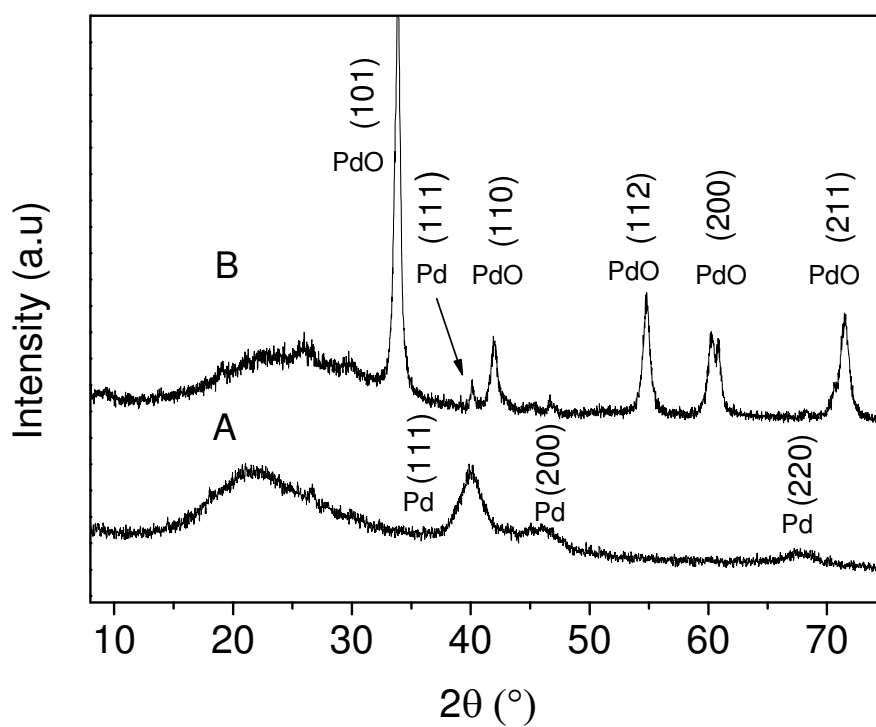


Figure S4. The XRD pattern of the Pd@micelles composite (A) and silica-coated Pd/silica nanotubes (B) following Method 2.

References

1. (a) Zhang, W.; Jiang, X.; He, Z.; Xiong, D.; Zheng, P.; An, Y.; Shi, L. *Polymer* **2006**, *47*, 8203. (b) Yao, X.; Chen, D.; Jiang, M. *J. Phys. Chem. B.* **2004**, *108*, 5225.