

## Supplementary Information

### Controlled Synthesis of Pd/Pt Core Shell Nanoparticles Using Area-selective Atomic Layer Deposition

Kun Cao<sup>1,2</sup>, Qianqian Zhu<sup>1,2</sup>, Bin Shan<sup>2\*</sup>, and Rong Chen<sup>1\*</sup>

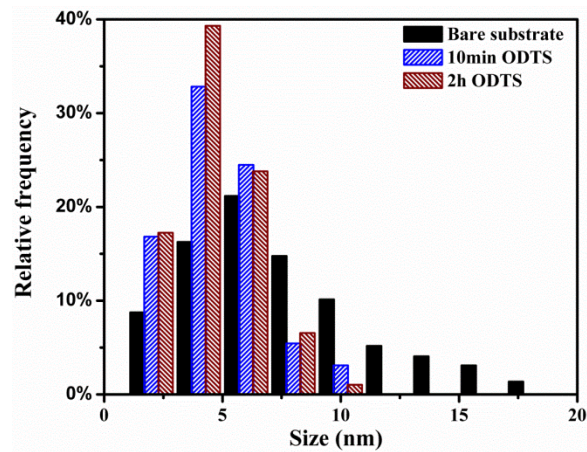
<sup>1</sup>State Key Laboratory of Digital of Manufacturing Equipment and Technology, School of Mechanical Science and Engineering, <sup>2</sup>State Key Laboratory of Material Processing and Die & Mould Technology, School of Materials Science and Engineering, Huazhong University of Science and Technology, 1037 Luoyu Road, Wuhan, Hubei PR China 430074

Corresponding Author

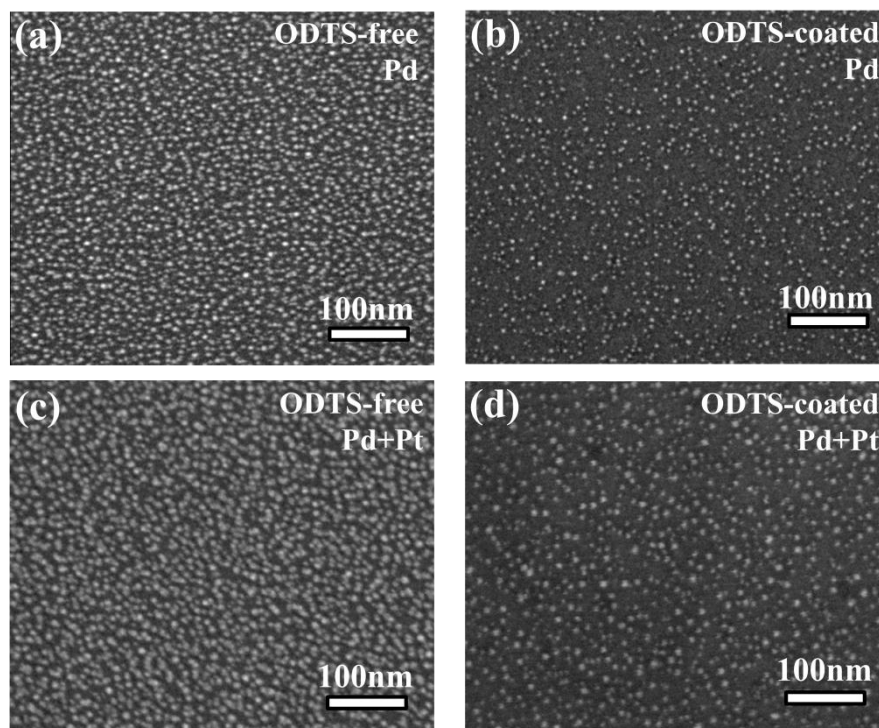
\*Email: rongchen@mail.hust.edu.cn, bshan@mail.hust.edu.cn;

**Table S1:** The statistical analysis of 300 cycles Pd nanoparticles grown on ODTS SAMs modified Si substrate with 0, 10min, 2h dip time.

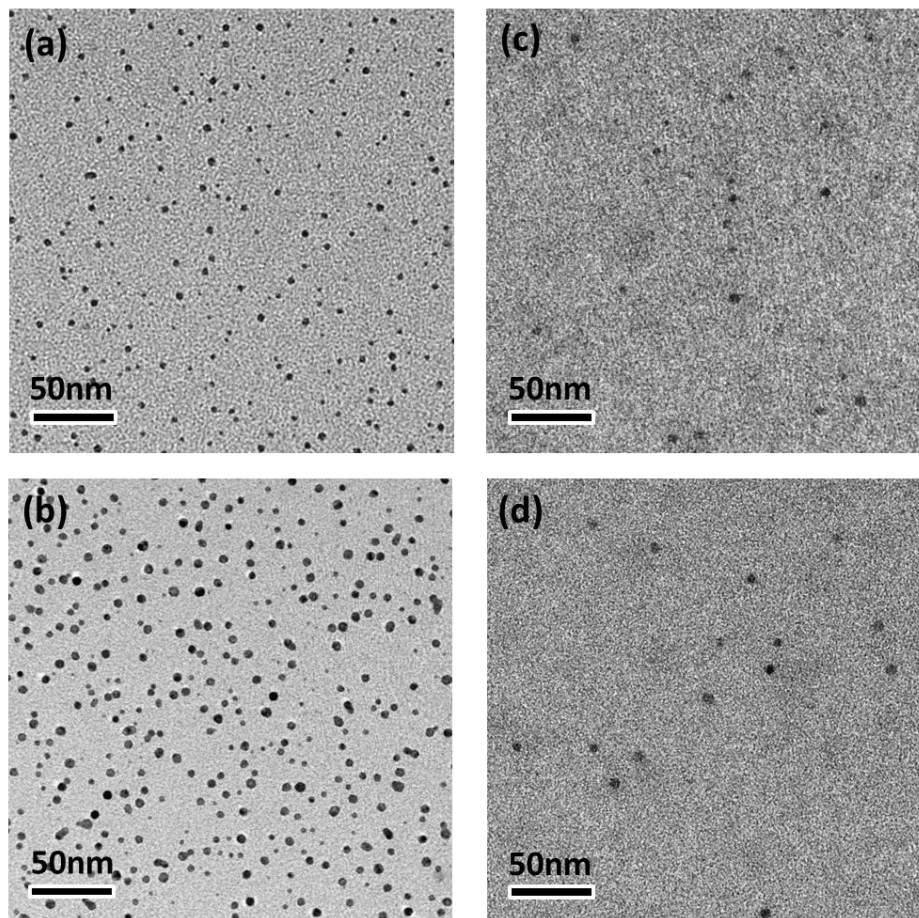
substrate	Coverage (%)	Density (counts/um <sup>2</sup> )	Average diameter (nm)	Diameter $\sigma$ (nm)
Si	20.8	$5.6 \times 10^3$	7.1	3.8
10min ODTS	12.1	$3.7 \times 10^3$	6.3	1.9
2h ODTS	8.7	$2.6 \times 10^3$	5.1	1.7



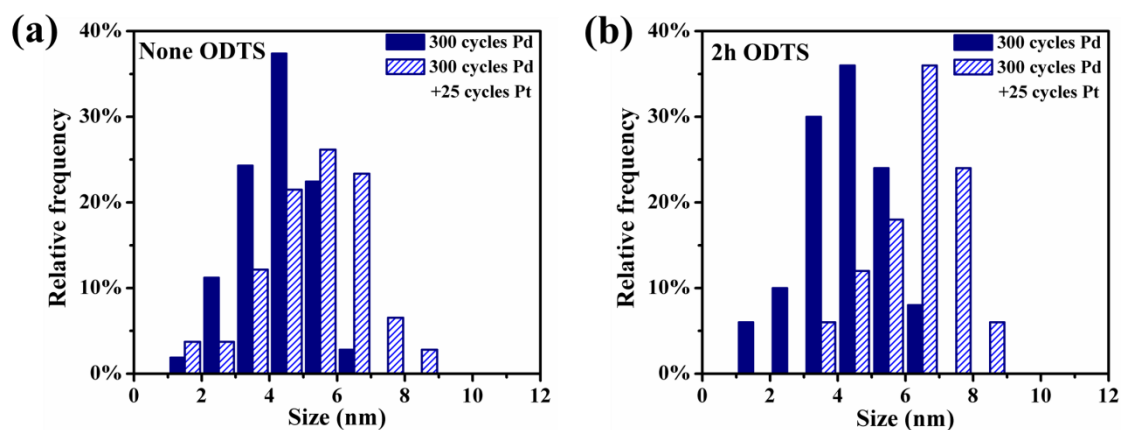
**Figure S1.** Particles size distribution of 300 cycles Pd on ODTS SAMs modified Si wafer with 0, 10min, 2h dip time.



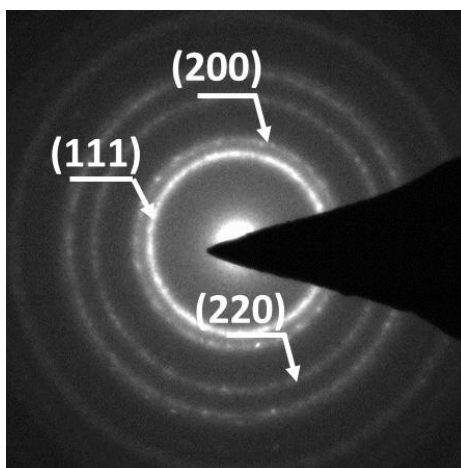
**Figure S2.** FSEM images of (a) 300 cycles of Pd on ODTS-free Si substrate, (b) 300 cycles of Pd +25 cycles of Pt on ODTS-free Si substrate; (c) 300 cycles of Pd on 2 h ODTS-coated Si substrate, (d) 300 cycles of Pd +25 cycles of Pt on 2 h ODTS-coated Si substrate.



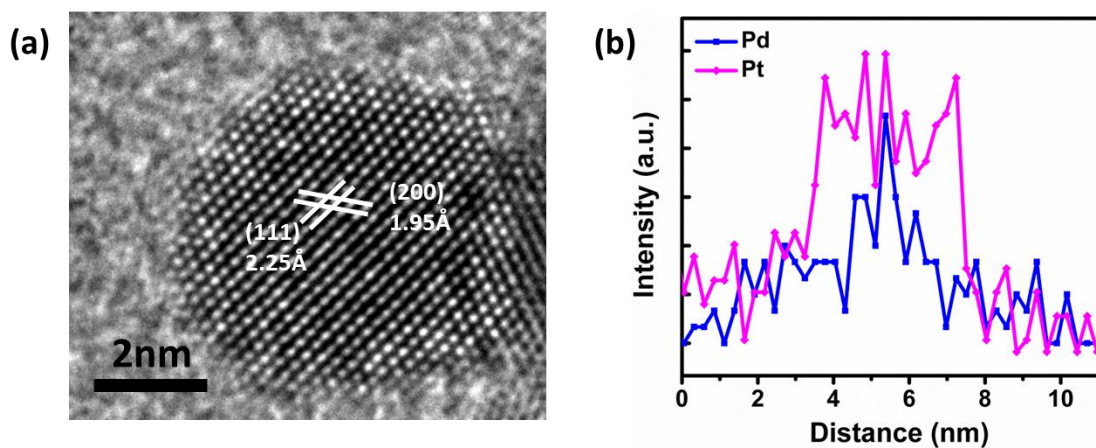
**Figure S3.** TEM characterization of the noble metal NPs on  $\sim 3\text{nm}$   $\text{Al}_2\text{O}_3$  pre-covered carbon grids. (a) 300 cycles Pd (b) 300 cycles Pd + 25 cycles Pt on bare  $\text{Al}_2\text{O}_3$ . Images (c) 300 cycles Pd, (d) 300 cycles Pd + 25 cycles Pt demonstrate the NPs grown on the 2h ODTs SAMs modified  $\text{Al}_2\text{O}_3$  surface.



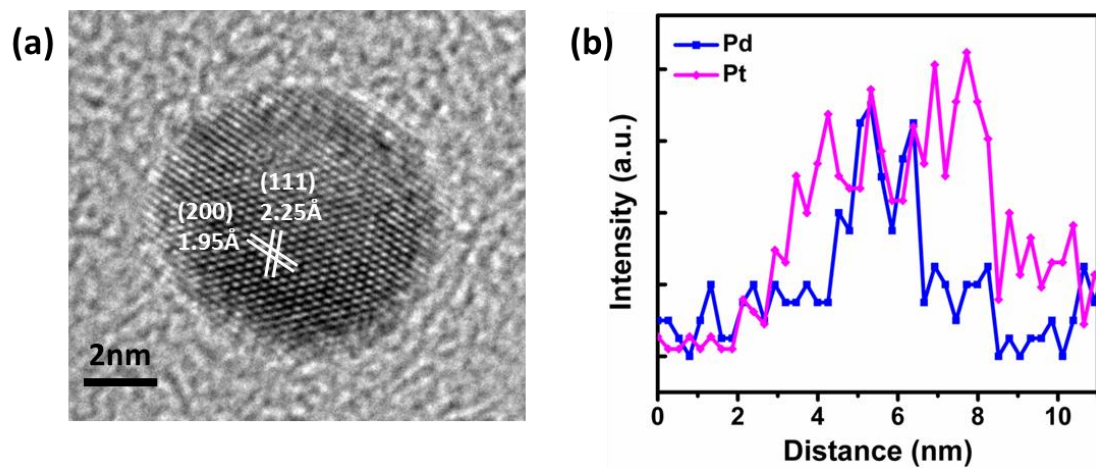
**Figure S4.** Particles size distribution analysis of the NPs on bare substrate and 2h ODTS modified substrate utilizing the TEM images in Figure S2. Histograms are made by counting 200 particles.



**Figure S5.** The selected area electron diffraction (SAED) pattern of core shell NPs of 300 cycles Pd followed with 25 cycles Pt on 2h ODTS SAMs.



**Figure S6.** (a) HRTEM images of Pd core (300 cycles) Pt shell (25 cycles) on 2h ODTs modified  $\text{Al}_2\text{O}_3$  film on carbon grid, (b) corresponding EDX line scan profile.



**Figure S7.** (a) HRTEM images of Pd core (300 cycles) Pt shell (25 cycles) after atmospheric environment annealing at 400 °C for 1h, (b) corresponding EDX line scan profile.