Electronic Supplementary Material (ESI) for Nanoscale.


## Supporting Information for

# Controlled Synthesis of Bimetallic Pd-Rh Nanoframes and Nanoboxs with High Catalytic Performances

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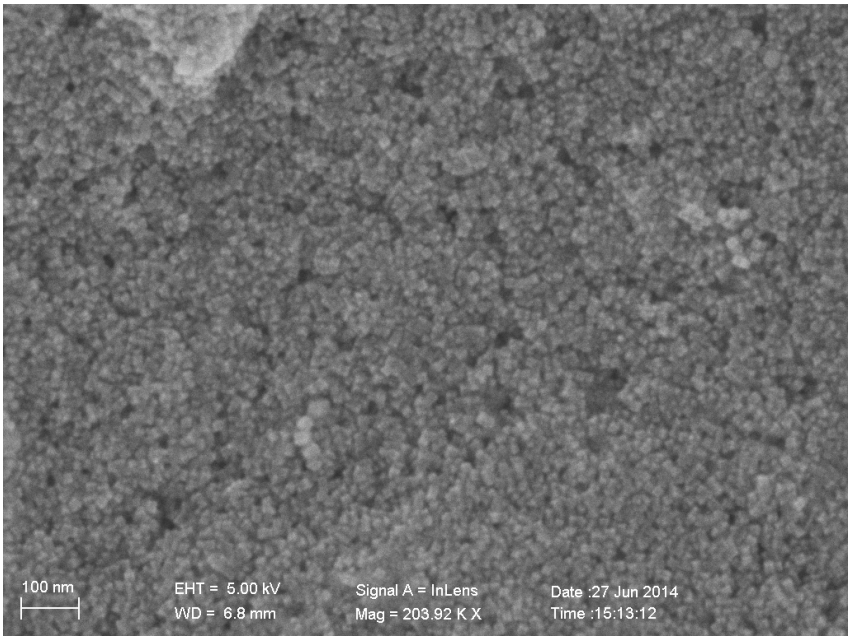


**Fig S1.** SEM image of Pd-Rh core-frame nanocubes (NCs-I).

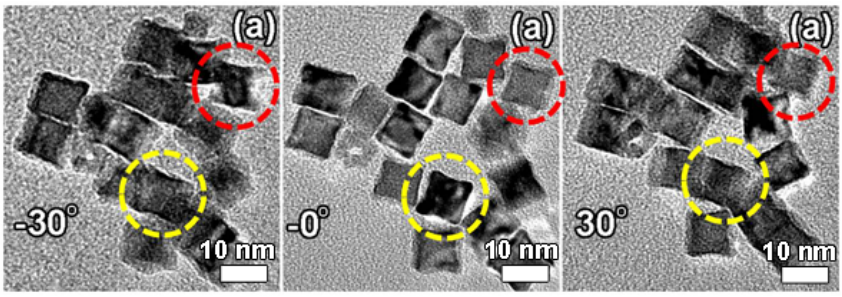


**Fig S2.** TEM images of Pd-Rh core-frame nanocubes (NCs-I) viewed at different tilting angles.

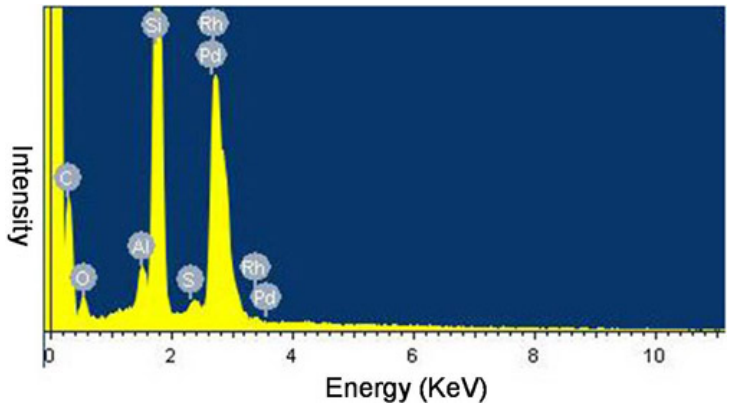


**Fig S3.** EDS spectrum of Pd-Rh core-frame nanocubes (NCs-I).

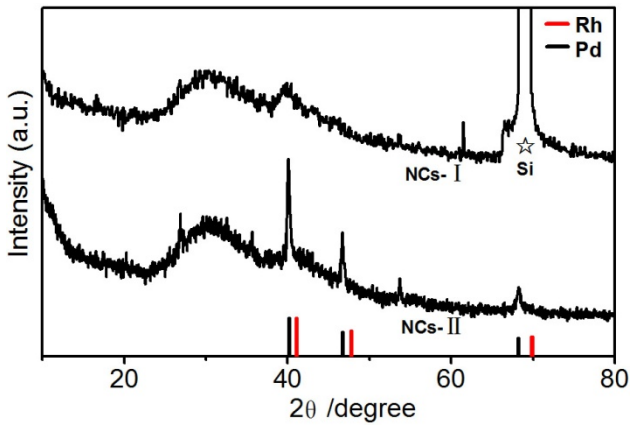


**Fig S4.** XRD profiles of Pd-Rh core-frame nanucubes (NCs-I) and Pd-Rh core-shell nanocubes (NCs-II). The broad peak located 70° is assigned to be the {331} facet of single-crystalline Si.

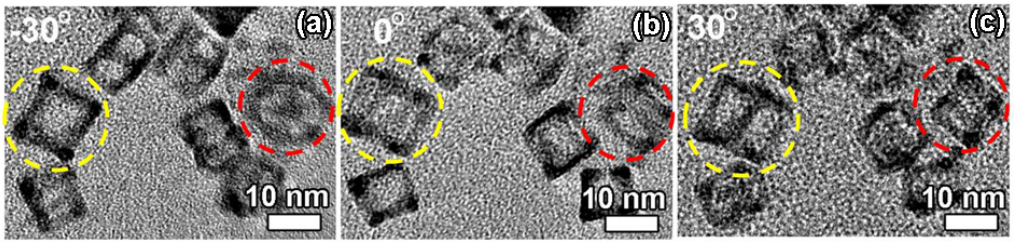


**Fig S5.** TEM images of Pd-Rh nanoframes viewed at different tilting angles.

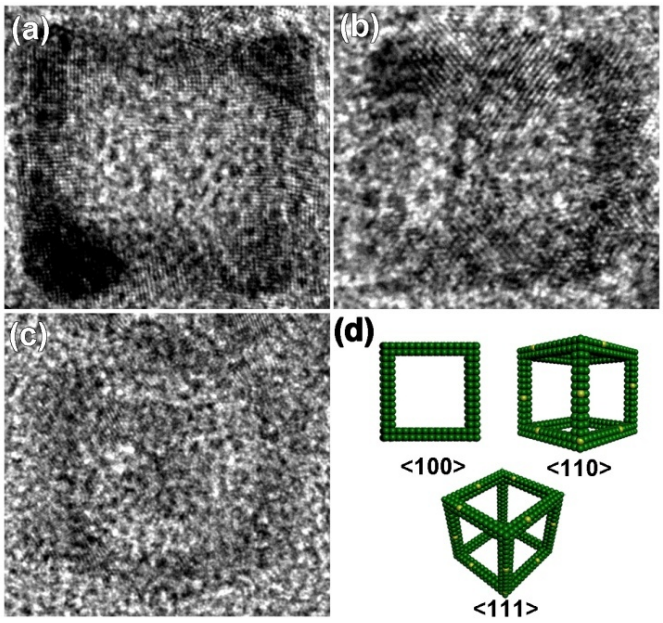


**Fig S6.** (a-c) TEM images of Pd-Rh nanoframes with different orientations, (d) the corresponding 3D models.

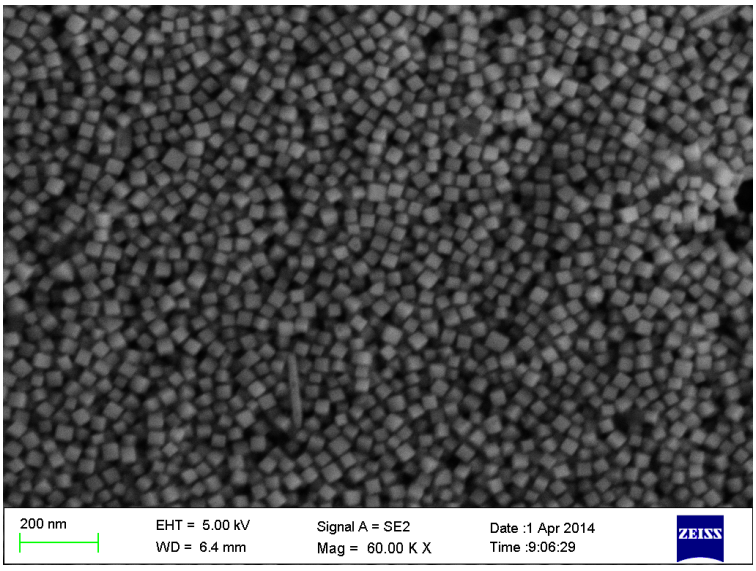


**Fig S7.** SEM image of Pd-Rh core-shell nanocubes (NCs-II).

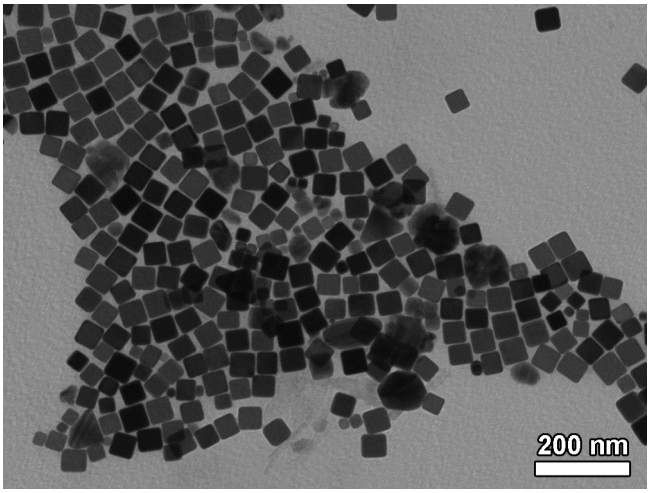


**Fig S8.** TEM image of the product with HCl and the other condition is fixed to the stand reaction for Pd-Rh core-shell nanocubes (NCs-II).

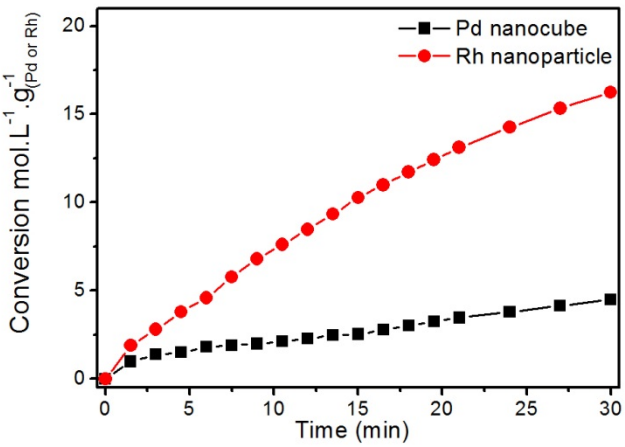


**Fig S9**. The catalytic activity of pure Rh and Pd nanoparticles at similar sizes.

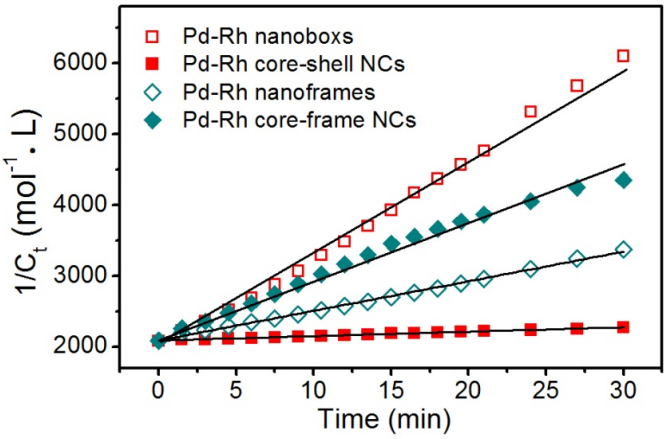


**Fig S10.** Plots of $1/C_t$ versus reaction time with different nanostructures as the catalysts.

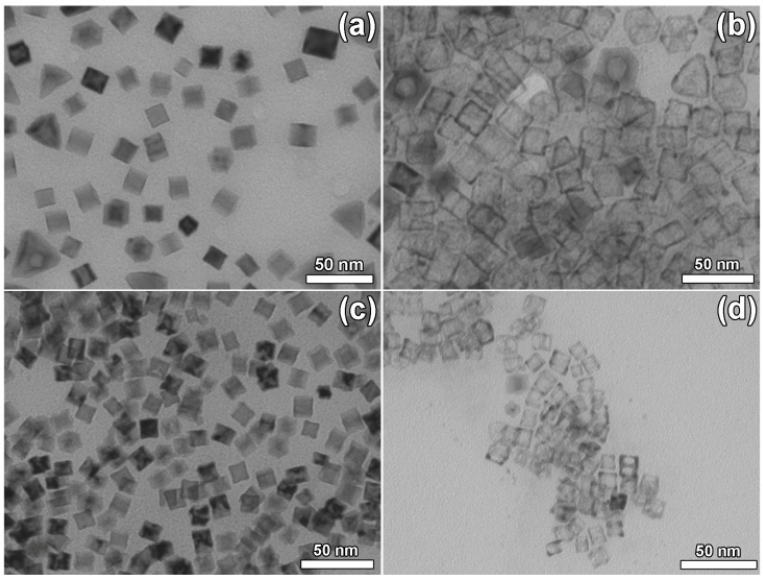


**Fig S11.** TEM images of nanostructures after three cycles of catalytic reaction: (a) Pd-Rh core-shell nanocubes, (b) Pd-Rh nanoboxs, (c) Pd-Rh core-frame nanocubes, (d) Pd-Rh nanoframes.

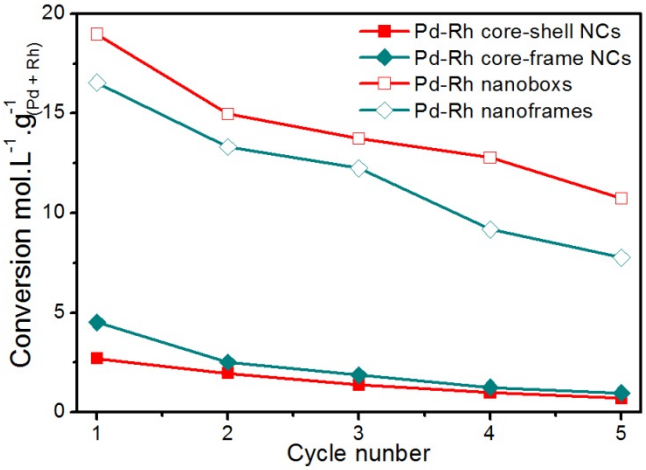


**Fig S12.** Cycle stability of different nanostructures.

**Table S1.** The atomic percentage of Pd-Rh nanostructures based on EDS spectra.

| Atomic percentage % | Pd | Rh |
|---|---|---|
| Pd-Rh core-shell NCs | 76.6 | 23.4 |
| Pd-Rh nanoboxes | 5.2 | 94.8 |
| Pd-Rh core-frame NCs | 45.9 | 54.1 |
| Pd-Rh nanoframes | 25.4 | 74.6 |

**Table S2**. Reaction rate constants of different catalysts.

| Nanostructures | Apparent rate constant($L^3 \cdot g^{-1} \cdot min^{-1}$) |
|---|---|
| Pd-Rh core-shell NCs | 0.191 |
| Pd-Rh nanoboxes | 8.65 |
| Pd-Rh core-frame NCs | 2.81 |
| Pd-Rh nanoframes | 3.76 |