nature protocols

https://doi.org/10.1038/s41596-023-00872-1

Protocol

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A general protocol for precise syntheses of ordered mesoporous intermetallic nanoparticles

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Supplementary information for

A general protocol for precise syntheses of ordered mesoporous intermetallic nanoparticles

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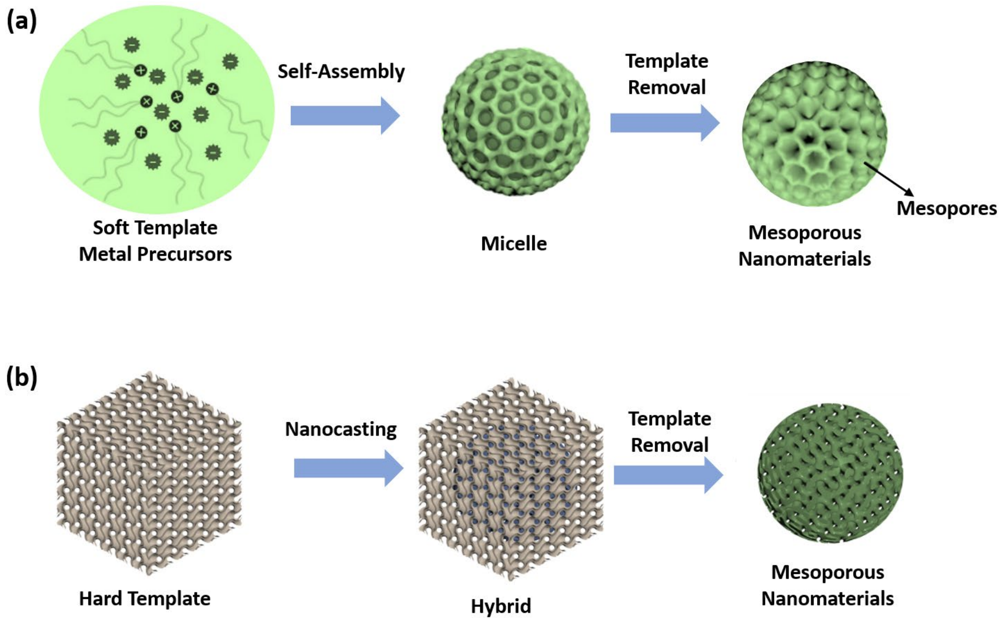

Figure S1 I (a) Soft-templating method and (b) hard-templating method for the syntheses of mesoporous nanomaterials.

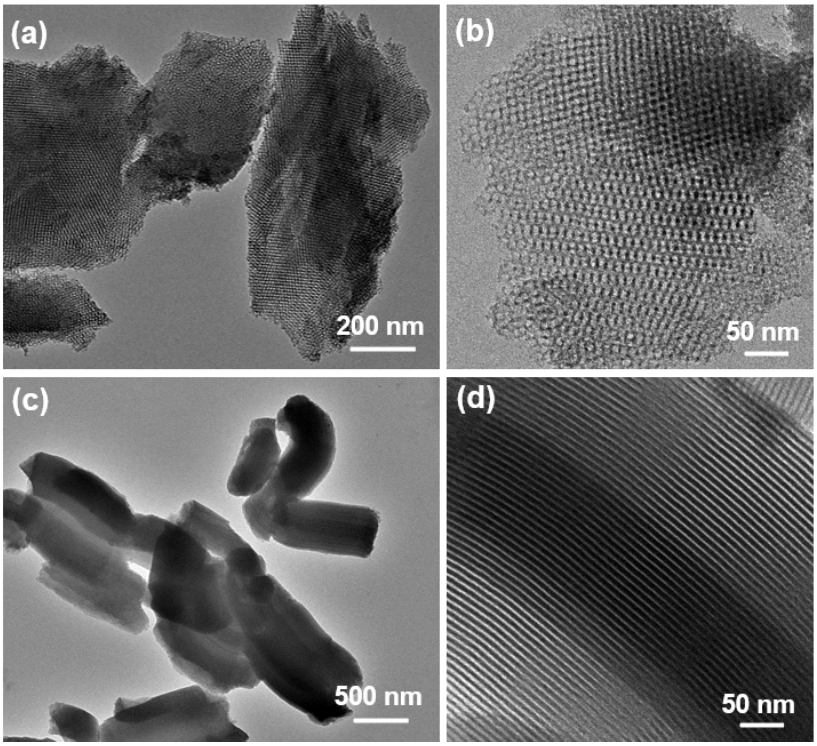

Figure S2 I TEM images of (a, b) KIT-6 and (c, d) SBA-15. Images adapted with permission from ref 36.

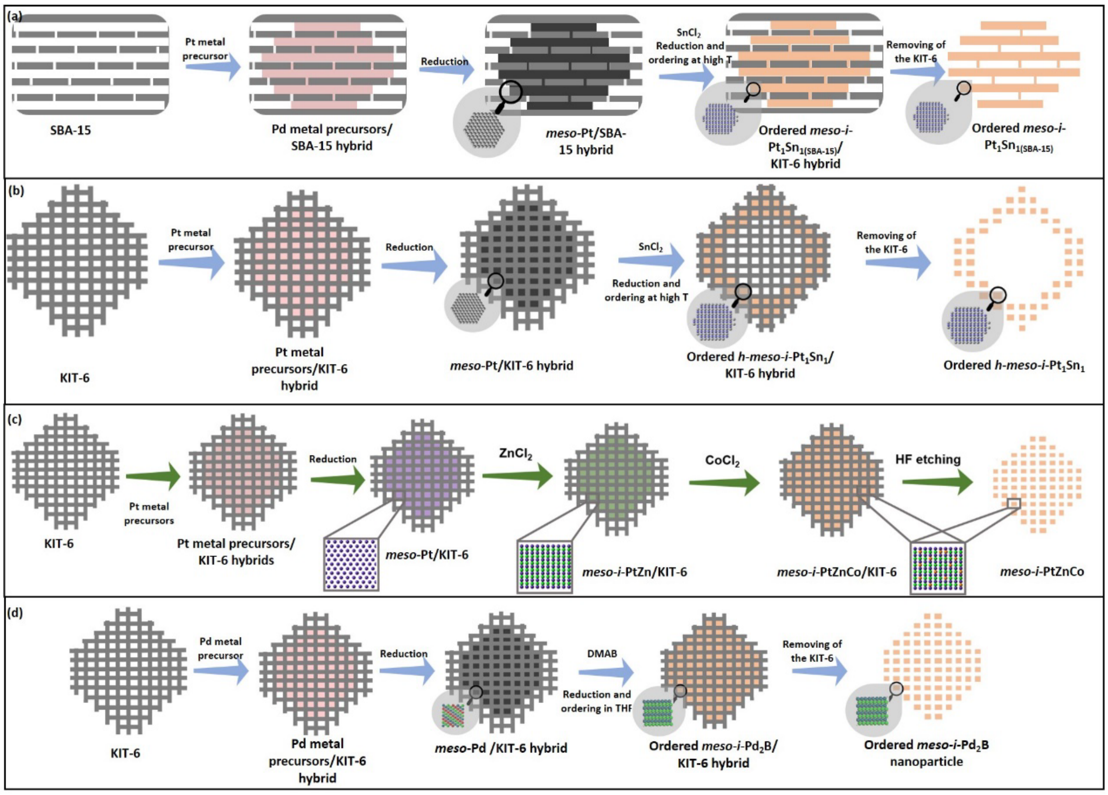

Figure S3 I The schematic procedures of the concurrent templates toward the syntheses of the mesoporous intermetallic nanoparticles of (a) *meso-i*-$Pt_1Sn_{1(SBA\text{-}15)}$, (b) *h-meso-i*-$Pt_1Sn_1$, (c) *meso-i*-PtZnCo and (d) *meso-i*-Pd_2B.

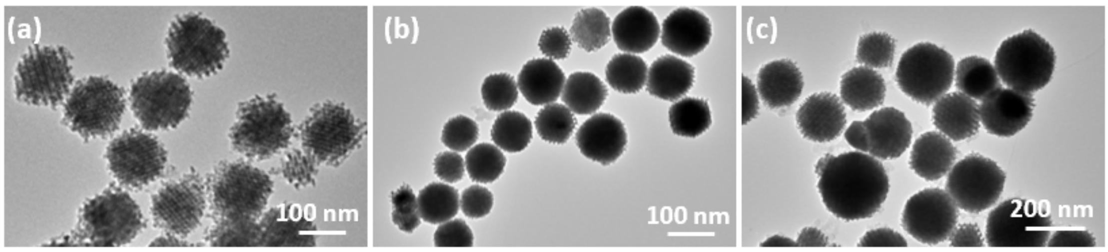

Figure S4 I TEM images of *meso-i*-Pt_1Sn_1 nanoparticles with a nanoparticle size of (a) 121 nm, (b) 164 nm, and (c) 208 nm. Images adapted with permission from ref 42.

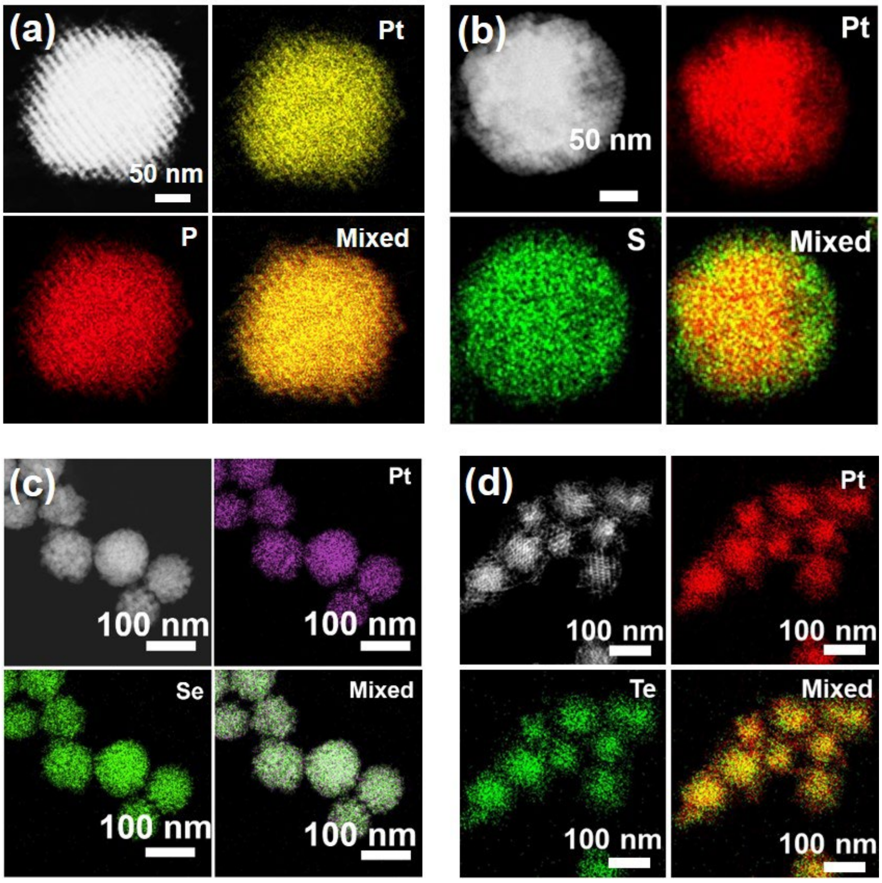

Figure S5 I STEM EDS mapping images of *meso-i*-PtP_2, *meso-i*-PtS_2, *meso-i*-$PtSe_2$ and *meso-i*-$PtTe_2$. Images adapted with permission from ref 73.

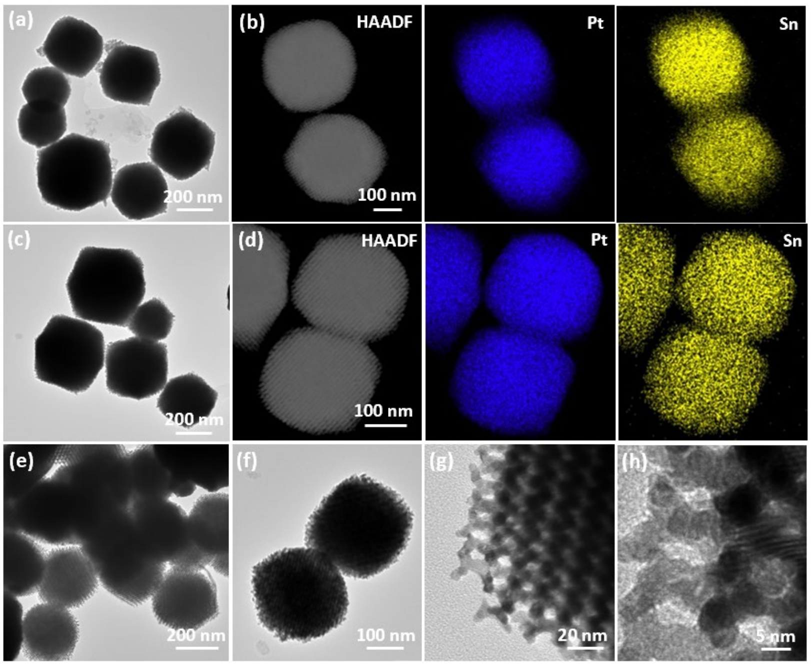

Figure S6 I STEM/TEM and STEM EDX images of (a,b) meso-i-Pt_1Sn_1, (c,d) meso-i-Pt_3Sn_1, and (e-h) meso-Pt nanoparticles after catalysis. All the nanoparticles retained their structure/morphology and composition, indicating a good catalytic stability. Images adapted with permission from ref 42.

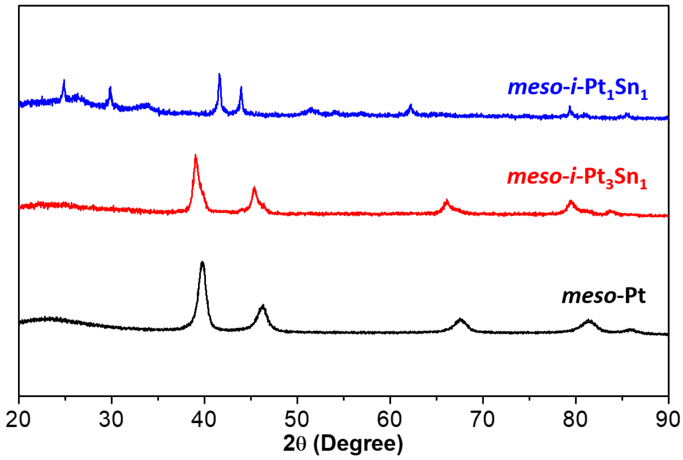

Figure S7 I PXRD patterns of *meso*-Pt, *meso*-*i*-Pt_3Sn_1, and *meso*-*i*-Pt_1Sn_1 nanoparticles after catalytic stability tests. All samples retained PXRD peaks well, indicating they are chemically stable for catalysis. Images adapted with permission from ref 42.

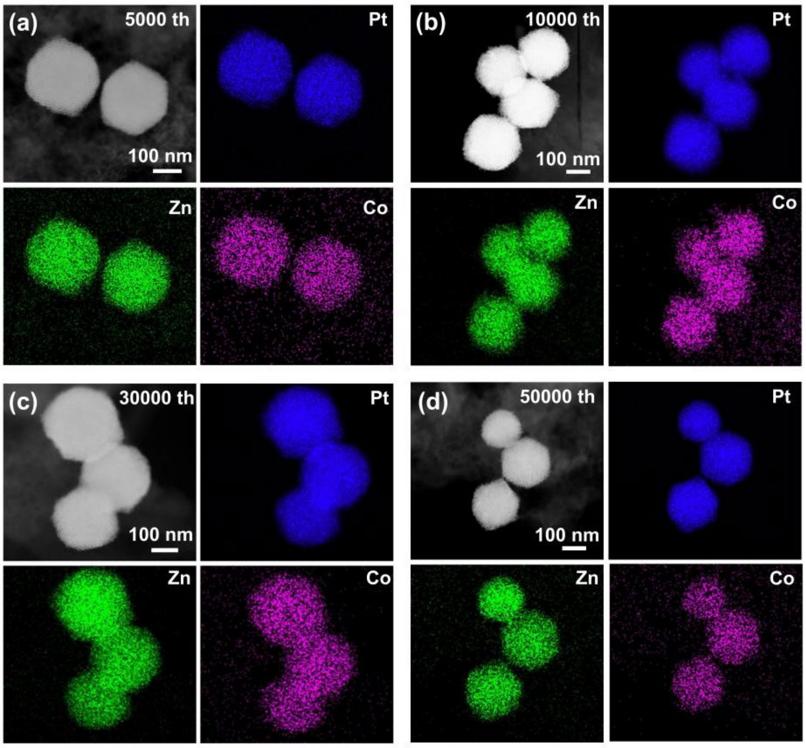

Figure S8 l EDS mapping images of *meso-i*-PtZnCo after the (a) 5000, (b) 10000, (c) 30000, (d) 50000 CV cycles. Images adapted with permission from ref 70.

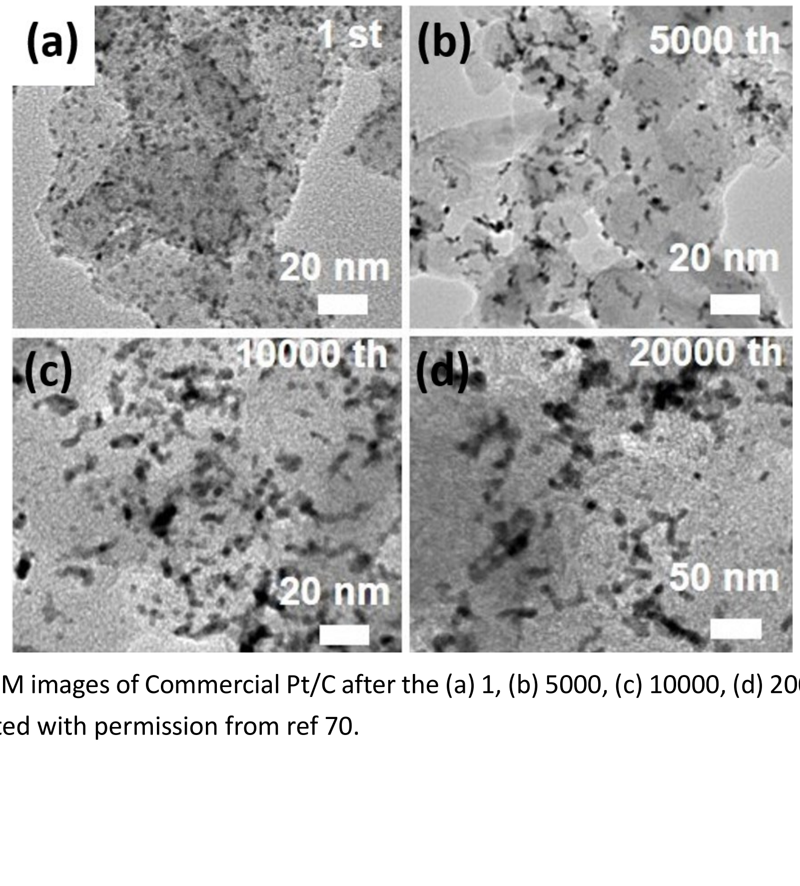

Figure S9 l TEM images of Commercial Pt/C after the (a) 1, (b) 5000, (c) 10000, (d) 20000 CV cycles. Images adapted with permission from ref 70.

Table S1 I Comparisons of the advantages and limitations of soft-templating, hard-templating, and concurrent template methods for the syntheses of mesoporous materials.

Method	Advantage	Limitation
Soft-templating method	Controllable mesoporous structures/ morphologies	1. Low thermal stability of soft templates; 2. Collapse of porous frameworks during the crystallization and removal of soft-template
Hard-templating method	A reliable strategy for most of crystalline oxides and sulfides, and single metals	1. Less adjustable of pore sizes and structures; 2. Inevitable nucleation at outside of pores, thus low yield; 3. High-cost and complicated preparation
Concurrent template method	1. A reliable syntheses of thermally stable metal alloys with high orderliness and crystallinity; 2. Easy to control elemental compositions	1. Less adjustable of pore sizes and structures; 2. High-cost and complicated preparation