Electronic Supplementary Information

Versatile synthesis of high surface area multi-metallic nanosponges allowing control over nanostructure and alloying for catalysis and SERS detection

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Figure captions:

Fig. S1. SEM images of Ag products obtained with air drying at r.t. (a) and 60 ^{o}C (b) instead of freeze drying.

Fig. S2. A low-magnification SEM image of Au nanosponges obtained with C_{Au} = 24 mM and T_{prep} = 0 °C while all other parameters remained as before.

Fig. S3. XRD patterns of Pd products obtained with different T_{prep} of 0 ^{o}C, 25 ^{o}C, and 60 ^{o}C.

Fig. S4. TEM and SEM images showing the Pd products prepared with different $PdCl_6^{2-}$ concentrations of 2 mM (a), 4 mM (b), 8 mM (c), and 24 (d) mM. The inset of d is the SAED pattern recorded from one circled bead.

Fig. S5. SEM and TEM images of Pd product obtained before (a) and after (b) t_{shake} = 1 min. The main effect is due to the addition of ethanol just before shaking. SEM images of the Pd products obtained with different shaking times of 5 (c), 30 (d), 60 (e), and 120 min (f). The inset of a is a corresponding TEM image.

Fig. S6. TEM (a) and HRTEM (b) images showing an interface between two beads in the Pd products obtained by shaking for t_{shake} = 60 min.

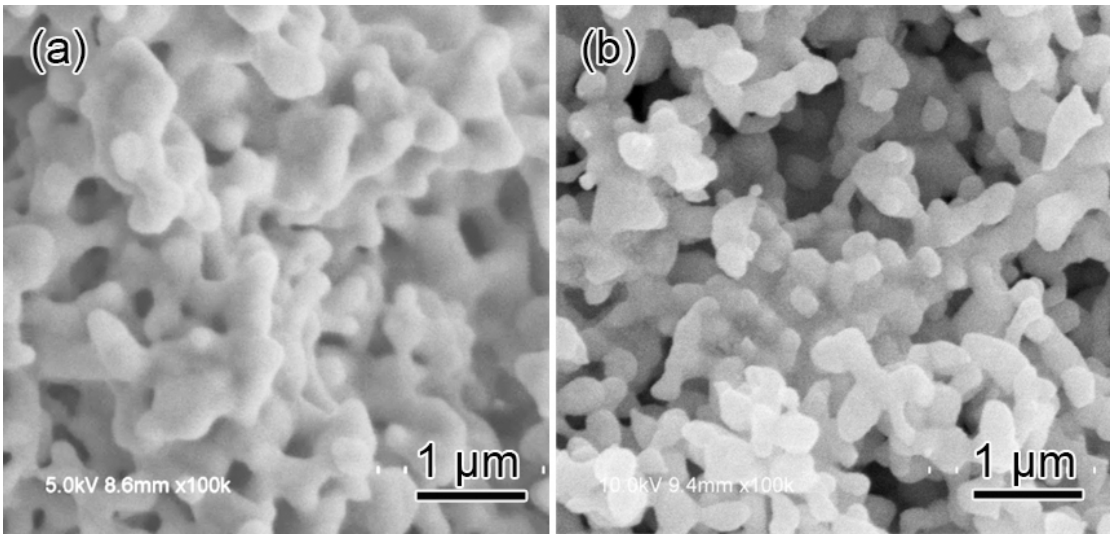
Fig. S7. XRD patterns of the obtained Ag-Au with different molar ratios (a), and typical bimetallic sponges of $Ag_{50}Pt_{50}$ (b), $Pd_{50}Pt_{50}$ (c), and $Ni_{20}Co_{80}$ (d).

Table S1. Molar ratios of noble-metal multi-metallic sponges synthesized from different volumes of 24 mM precursor solutions.

Fig. S8. XRD pattern of the products obtained via combining Ag and Pd NPs' suspensions instead of ion solutions, yet otherwise with the same procedures as those for alloys.

Fig. S9. SEM images of the Pd products obtained by replacing ethanol (a) and glycerol (b) with water in the mixed reagent.

Supplementary Fig.s and captions



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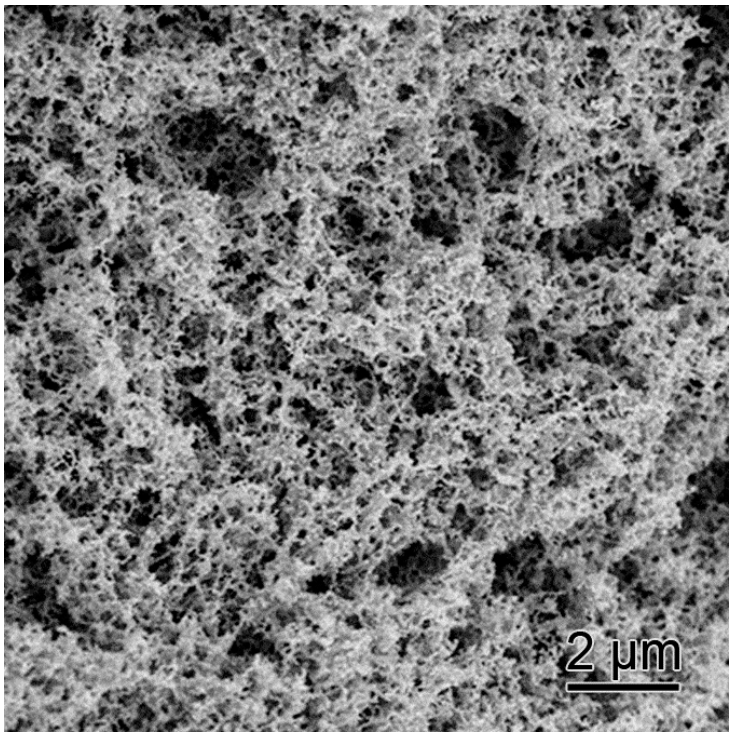

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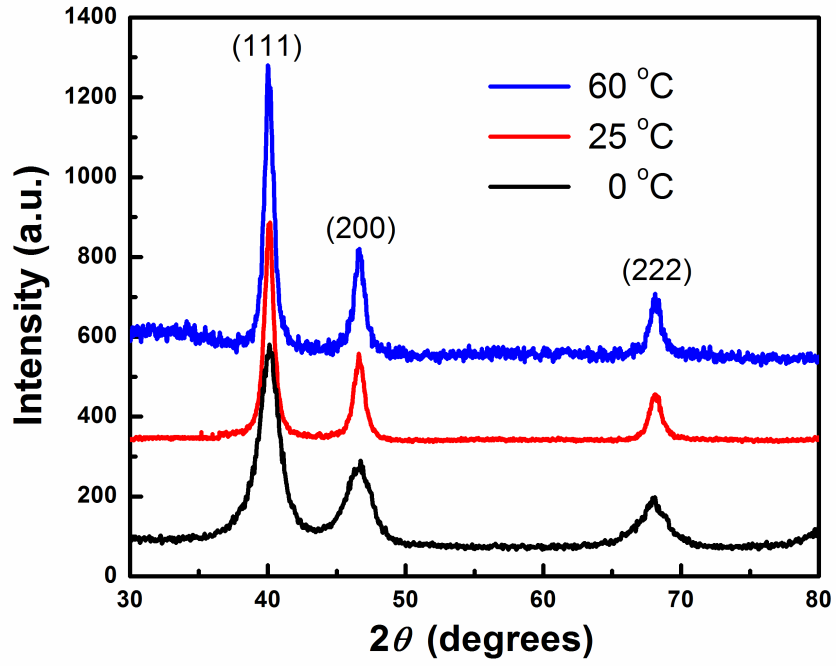
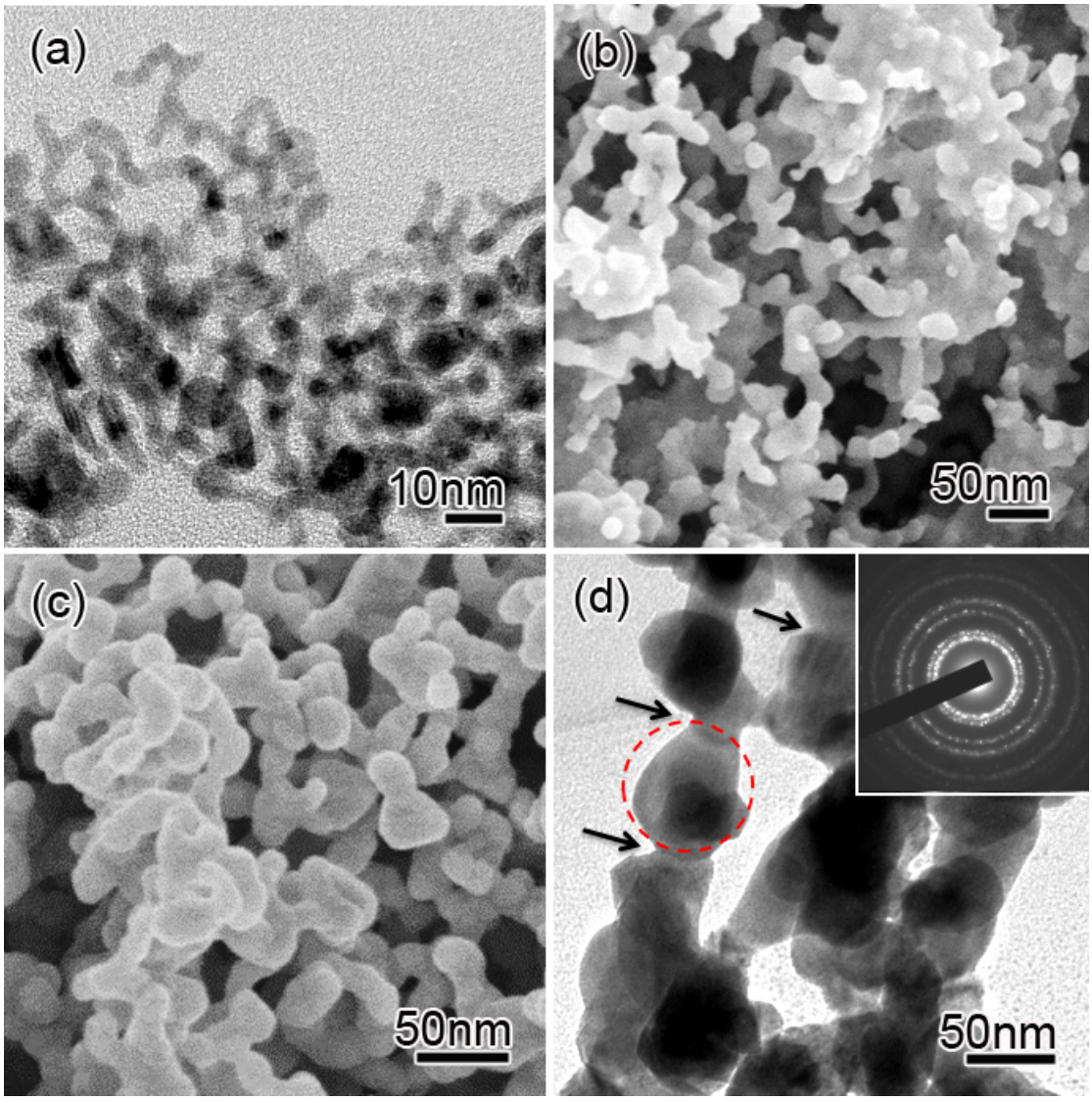


Fig. S3. XRD patterns of Pd products obtained with different T_{prep} of 0 °C, 25 °C, and 60 °C.



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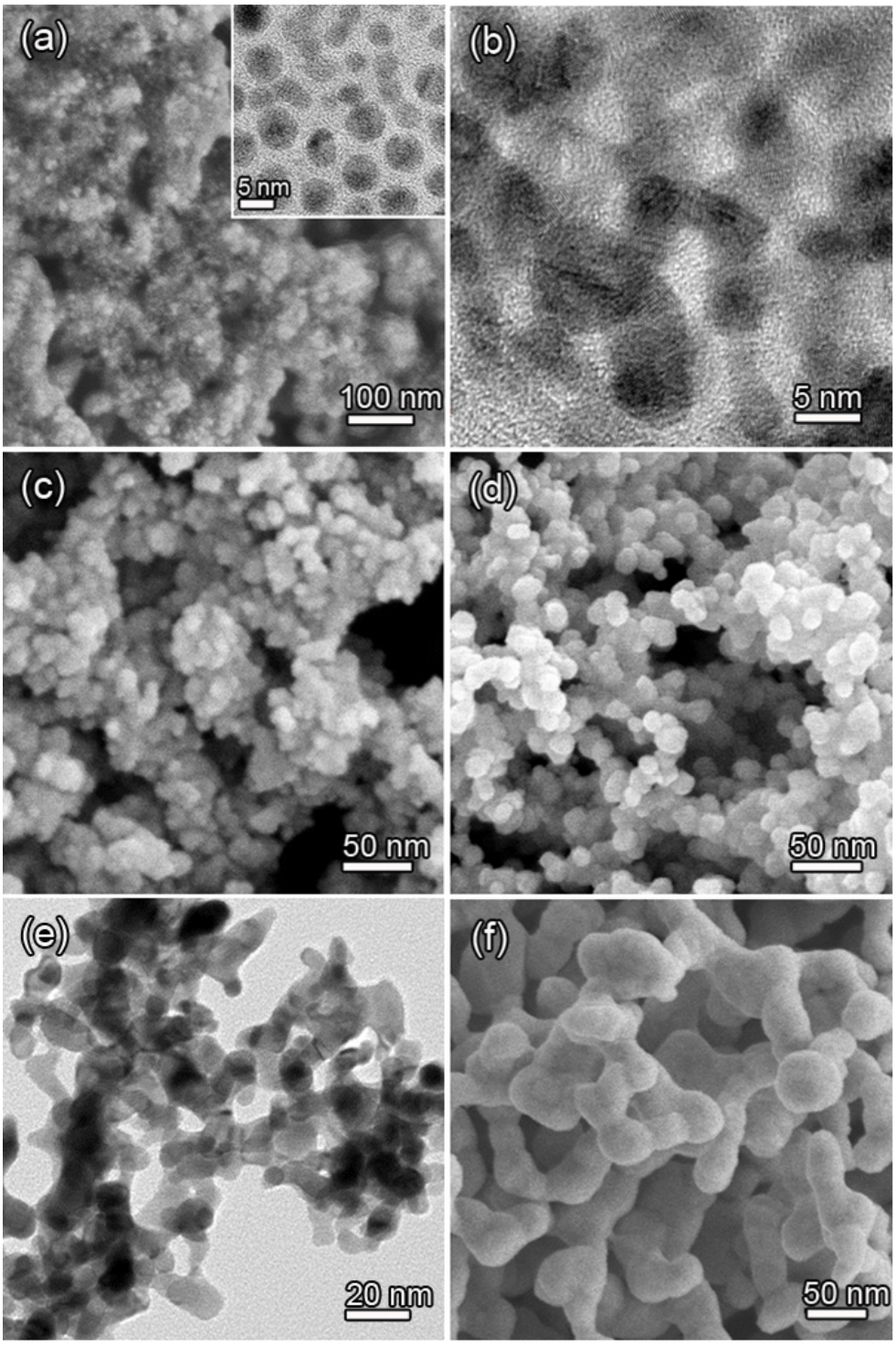

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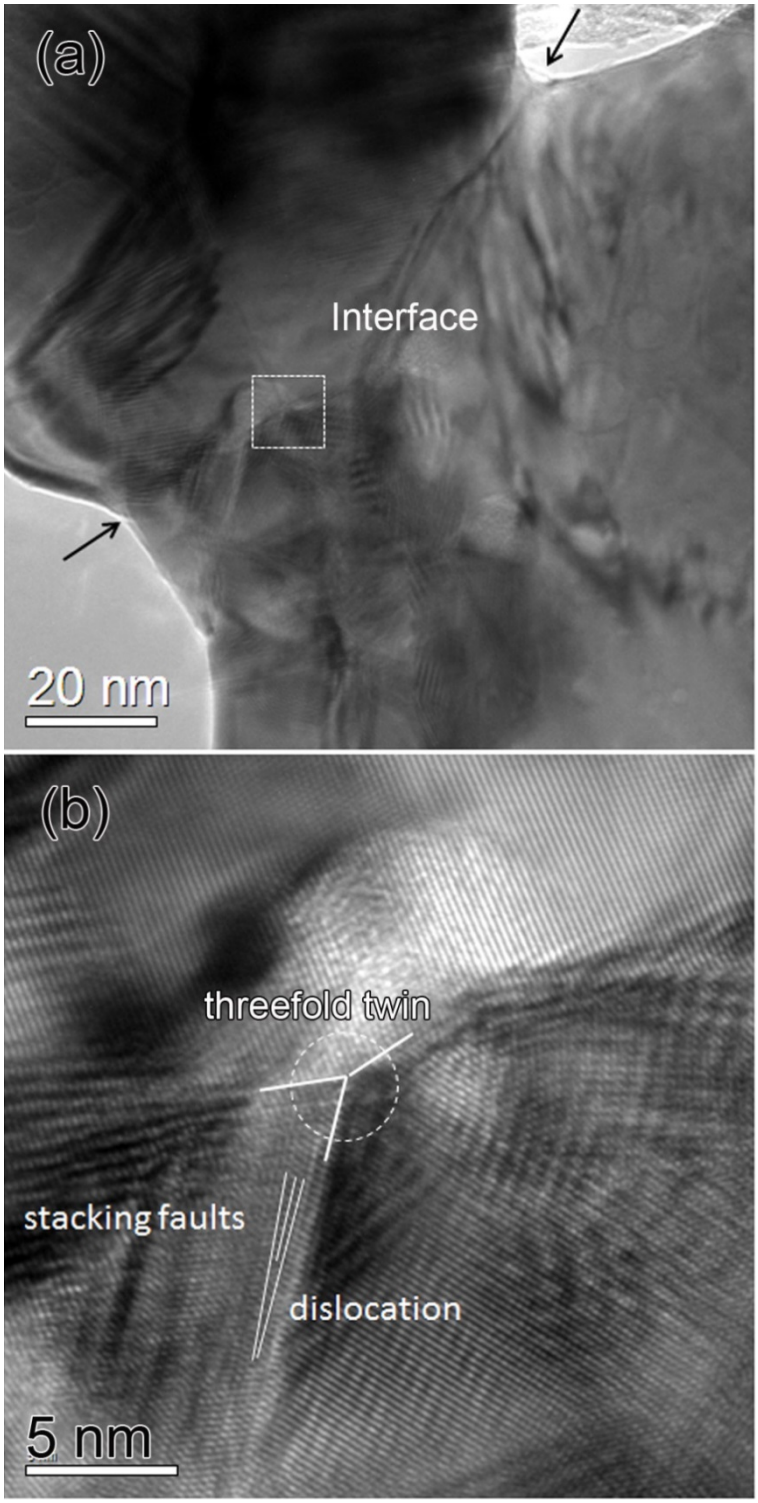

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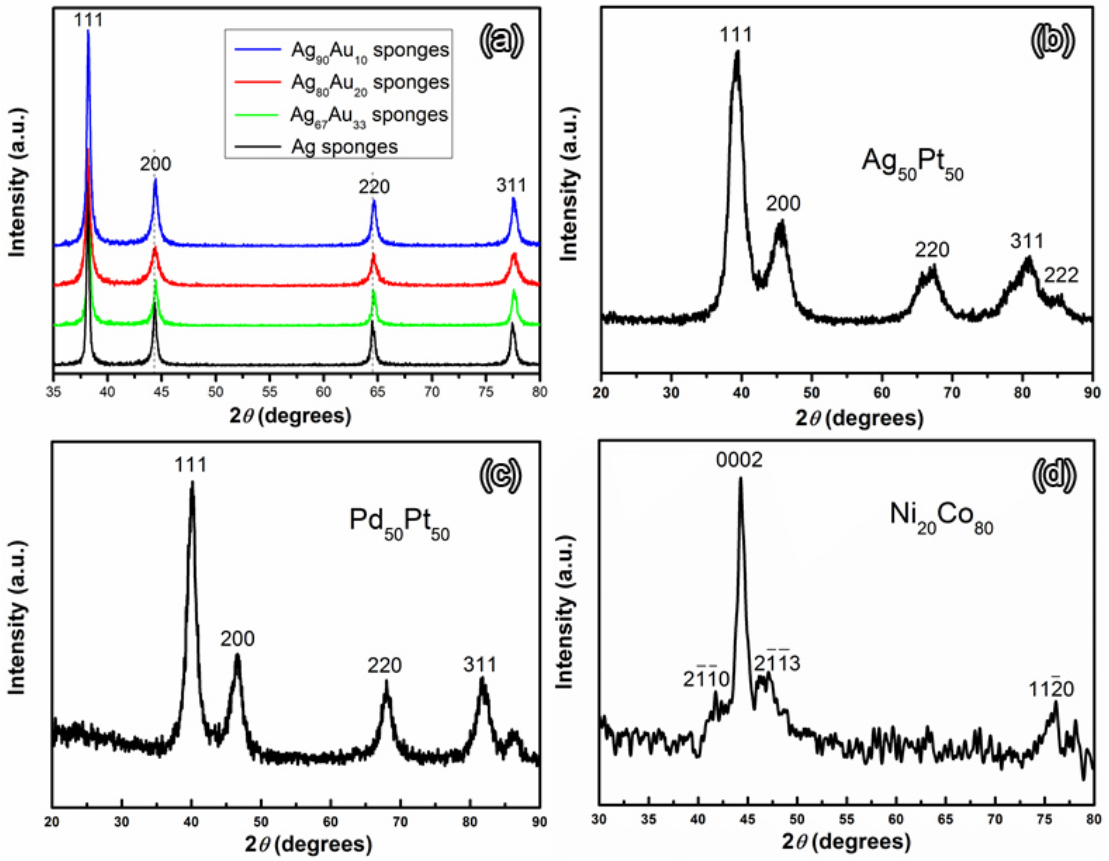

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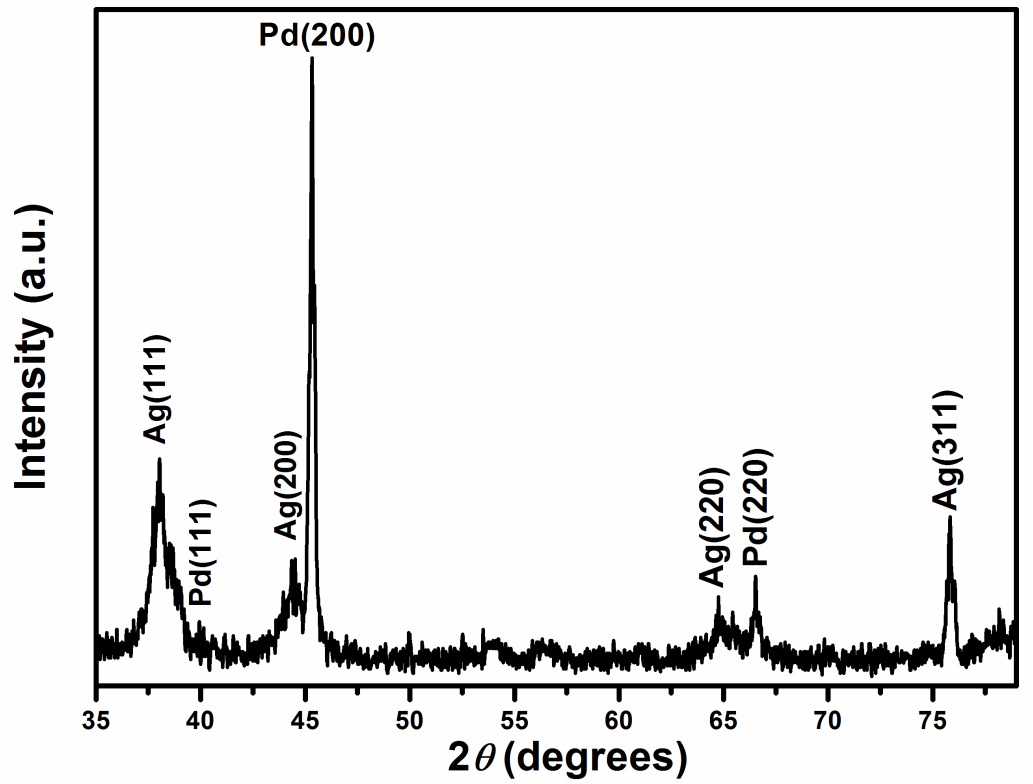
Table S1. Molar ratios of noble-metal multi-metallic sponges synthesized from different volumes of 24 mM precursor solutions.

	$AgNO_3$ [mL]	$HAuCl_4$ [mL]	K_2PdCl_4 [mL]	K_2PtCl_6 [mL]
$Ag_{50}Pd_{50}$	5.00	/	5.00	/
$Ag_{75}Pd_{25}$	7.50	/	2.50	/
$Ag_{67}Pd_{33}$	6.67	/	3.33	/
$Ag_{50}Au_{50}$	5.00	5.00	/	/
$Ag_{75}Au_{50}$	7.50	2.50	/	/
$Au_{50}Pd_{50}$	/	5.00	5.00	/
$Ag_{50}Pt_{50}$	5.00	/	/	5.00
$Ag_{75}Pt_{25}$	7.50	/	/	2.50
$Ag_{67}Pt_{23}$	6.67	/	/	3.33
$Pd_{75}Pt_{25}$	/	/	7.50	2.50
$Pd_{67}Pt_{33}$	/	/	6.67	3.33
$Pd_{50}Pt_{50}$	/	/	5.00	5.00
$Ag_{34}Au_{33}Pd_{33}$	3.34	3.33	3.33	/
$Ag_{40}Au_{40}Pd_{20}$	4.00	4.00	2.00	/
$Ag_{60}Au_{20}Pd_{20}$	6.00	2.00	2.00	/
$Ag_{34}Pd_{33}Pt_{33}$	3.33	/	3.33	3.33



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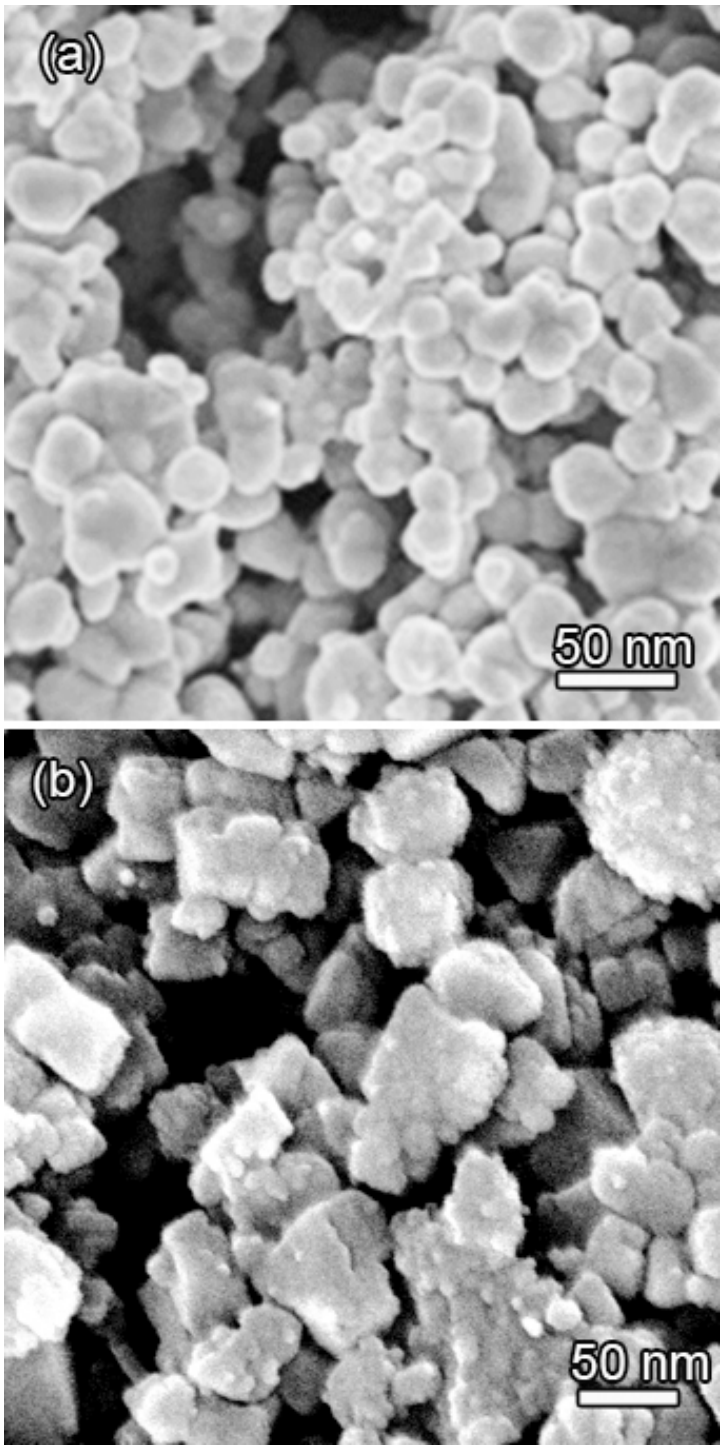

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