

Supporting Information

Synthesis of Binary Solid Solution Cu-Pd Nanoparticles by DMF Reduction for Enhanced Photoluminescent Properties

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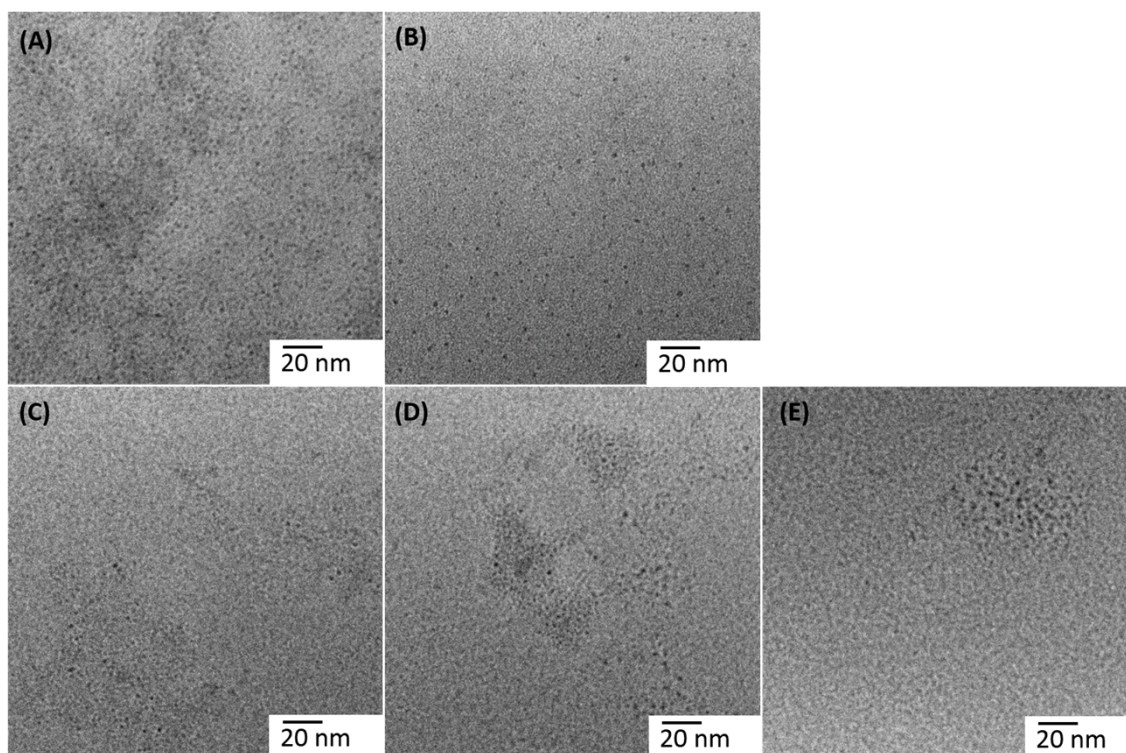


Figure S1. TEM images of Cu NPs (A), Pd NPs (B) and Cu-Pd NPs synthesized using equimolar feeding ratio (C-E).

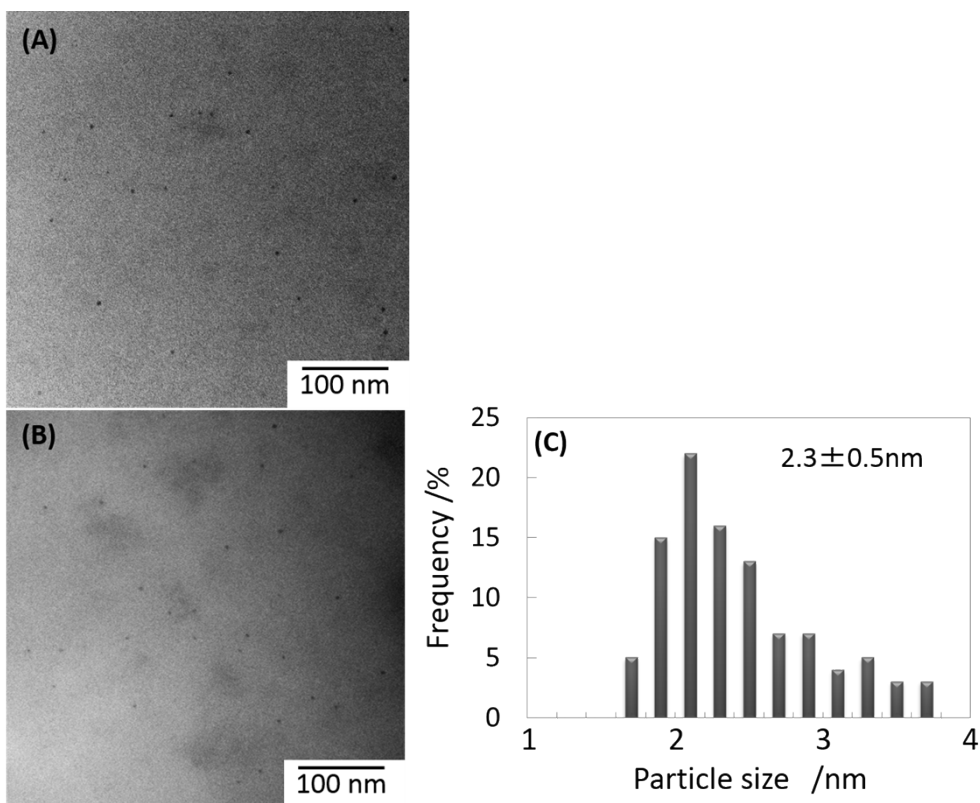


Figure S2. TEM image (A) and size distribution (B) of Cu₉₀Pd₁₀ NPs.

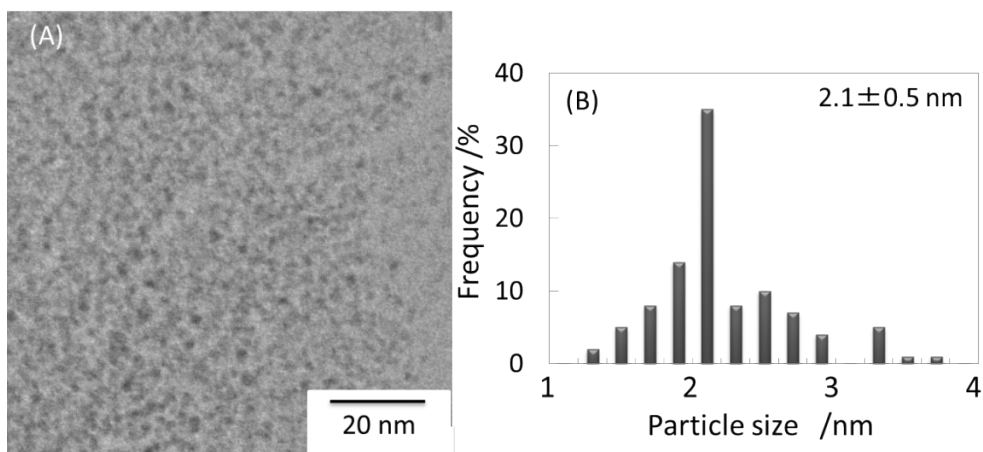


Figure S3. TEM image (A) and size distribution (B) of Cu₇₅Pd₂₅ NPs.

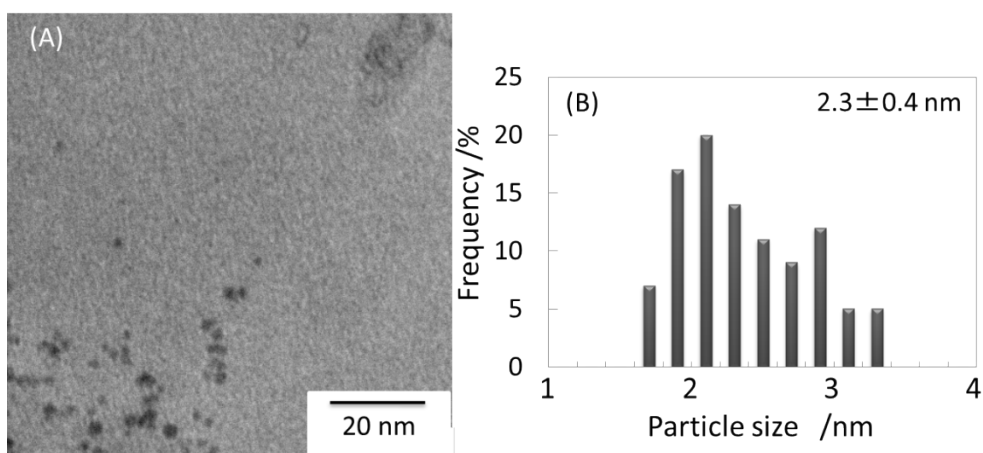


Figure S4. TEM image (A) and size distribution (B) of Cu₂₅Pd₇₅ NPs.

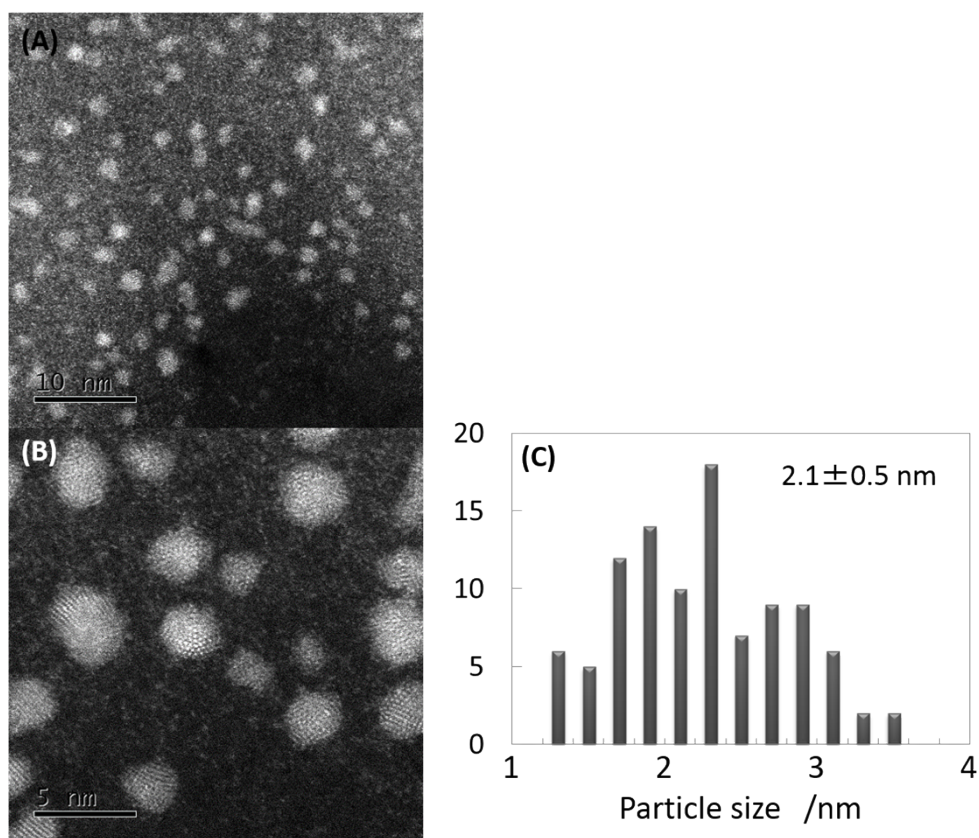


Figure S5. Dark-field TEM image (A) and HAADF image (B) and size distribution (C) of Cu₁₀Pd₉₀ NPs.

XPS core level spectra of Cu 2p and Pd 3d are fitted using Gaussian-Lorentzian (G-L) mix function:

$$f(x) = \frac{I_0}{\{1 + M(x-x_0)^2 / \Gamma^2\} \exp\{(1-M) \ln 2 (x-x_0)^2 / \Gamma^2\}}$$

where I_0 , x_0 , x , Γ , and M are the peak height, the peak position (binding energy), the binding energy, a parameter for the peak width, and the G-L mixing ratio, respectively. $M = 0$ gives a pure Gaussian curve, while $M = 1$ gives a pure Lorentzian curve.

Curve fitting parameters for Cu 2p_{3/2} core level of Cu-Pd nanoparticles synthesized using various molar feeding ratios:

Cu (at. %)		Cu100		Cu 90		Cu 75		Cu 50	
2p5/2	Peak position	933.21	934.4	932.9	934.3	932.8	934.3	337.235	338.45
	FWHM	1.1	1.1	1.1	1.1	1	1.1	1.1	1.1
	M	0.3	0.3	0.3	0.3	0.3	0.3	0.96	0.95

Cu (at. %)		Cu 25		Cu 10	
2p5/2	Peak position	932.24	933.95	932.24	933.95
	FWHM	0.93	1	0.8	0.8
	M	0.3	0.3	0.3	0.3

Curve fitting parameters for Pd 3d core level of Cu-Pd nanoparticles synthesized using various molar feeding ratios:

Pd (at. %)		Pd 100		Pd 90			Pd 75		
3d _{5/2}	Peak position	336.12	337.3	335.8	336.6	338.1	336.57	337.235	338.45
	FWHM	0.95	0.95	1.15	1.1	1.15	1.1	1.1	1.1
	<i>M</i>	0.9	0.9	0.96	0.94	0.94	0.95	0.96	0.95
3d _{3/2}	Peak position	341.25	342.45	341	341.8	343.3	341.77	342.47	343.65
	FWHM	0.78	78	1.1	1.1	1.1	1.05	1.05	1.05
	<i>M</i>	0.7	0.7	0.93	0.94	0.94	0.93	0.94	0.94
Spin-orbit intensity ratio		1.94	1.82	1.5	1.42	1.6	1.75	1.92	1.71
Spin-orbit splitting		5.13	5.15	5.2	5.2	5.2	5.2	5.235	5.2

Pd (at. %)		Pd 50			Pd 25			Pd 10		
3d _{5/2}	Peak position	336.3	337.16	338.5	336.56	337.3	338.66	336.55	337.9	339.2
	FWHM	1.1	1.13	1.13	1.11	1.11	1.13	1.15	1.15	1.15
	<i>M</i>	0.97	0.94	0.97	0.94	0.94	0.95	0.98	0.98	0.98
3d _{3/2}	Peak position	341.5	342.36	343.65	341.75	342.5	343.79	341.8	343.1	344.15
	FWHM	0.9	1.08	1	1.15	1.05	1.05	1.1	1.25	1.25
	<i>M</i>	0.93	0.93	0.93	0.9	0.85	0.85	0.9	0.9	0.9
Spin-orbit intensity ratio		2	1.99	2.25	2.86	2.69	3.45	5.75	10	5.47
Spin-orbit splitting		5.2	5.2	5.15	5.19	5.2	5.13	5.25	5.2	4.95

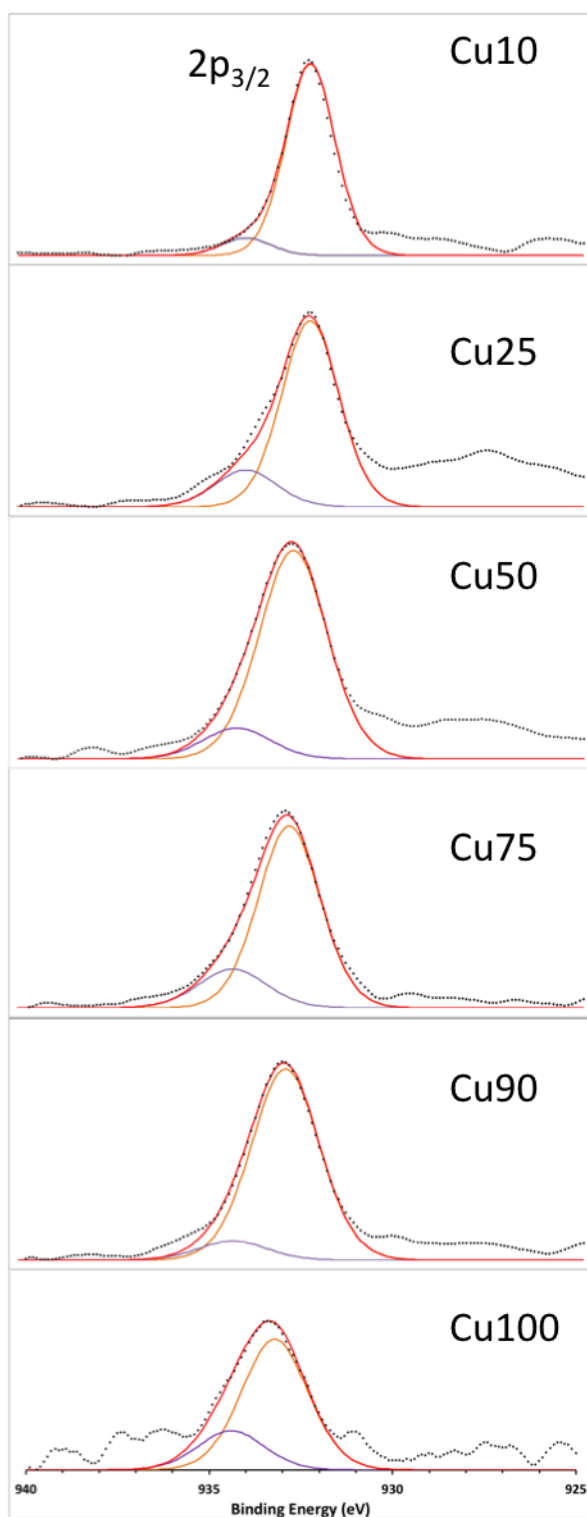


Figure S6. Curve fitting for XPS Cu 2p_{3/2} core level of Cu in Cu-Pd nanoparticles synthesized using feeding ratios from 10 to 100 % of Cu precursor from the top to bottom. The red solid lines and black dotted lines are the sum spectra (of violet and orange curve) and raw spectra of Cu 2p core level.

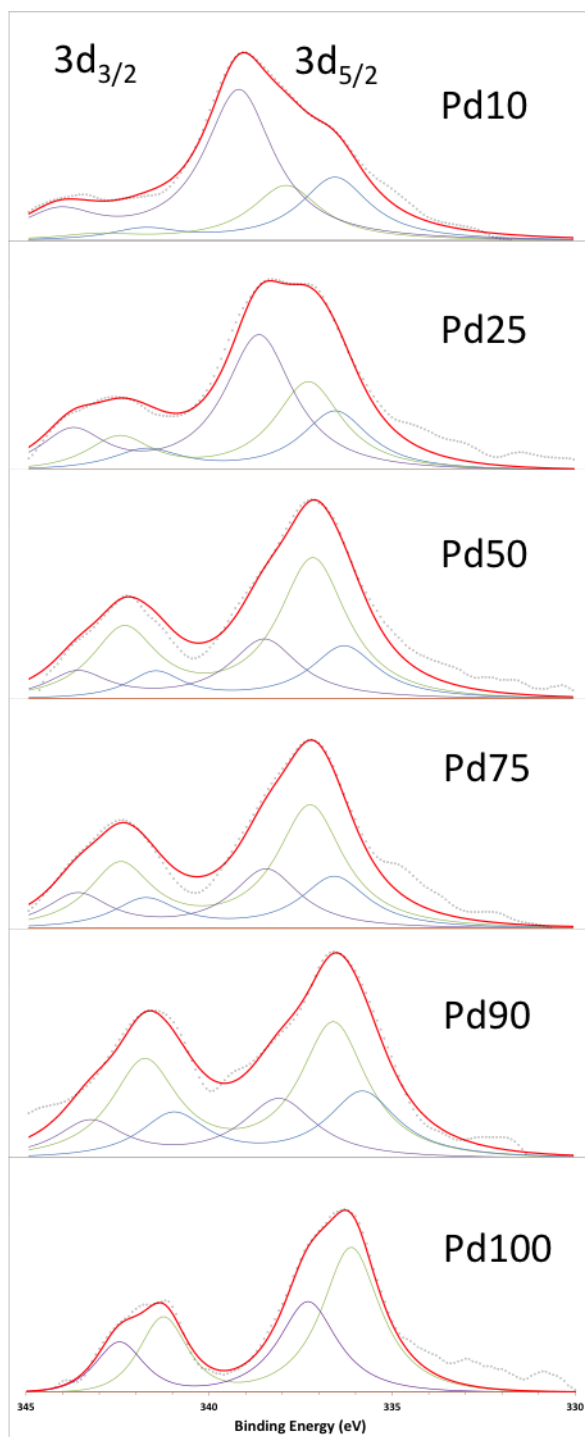


Figure S7. Curve fitting for XPS 3d core level of Pd in Cu-Pd nanoparticles synthesized using feeding ratios from 10 to 100 % of Pd precursor from the top to bottom. The red solid lines and black dotted lines are the sum spectra (of violet, green and blue curve) and raw spectra of Pd 3d core level.