

Supporting Information for

Facile synthesis of Cu/Ni alloy nanospheres with tunable size and elemental ratio

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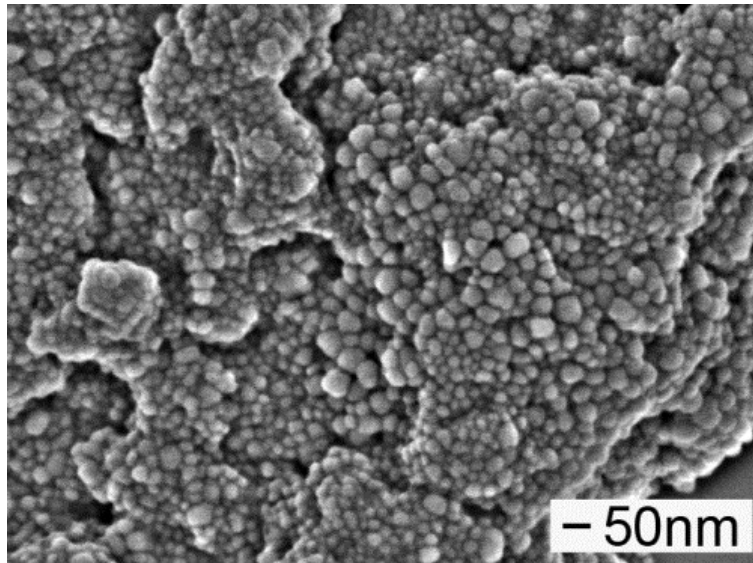
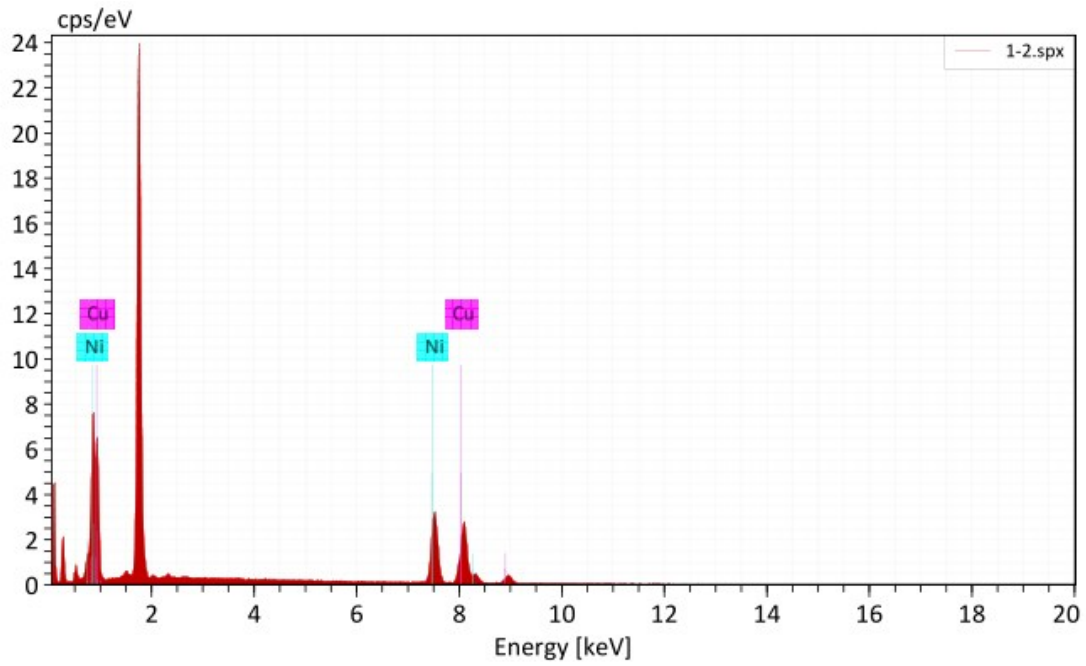
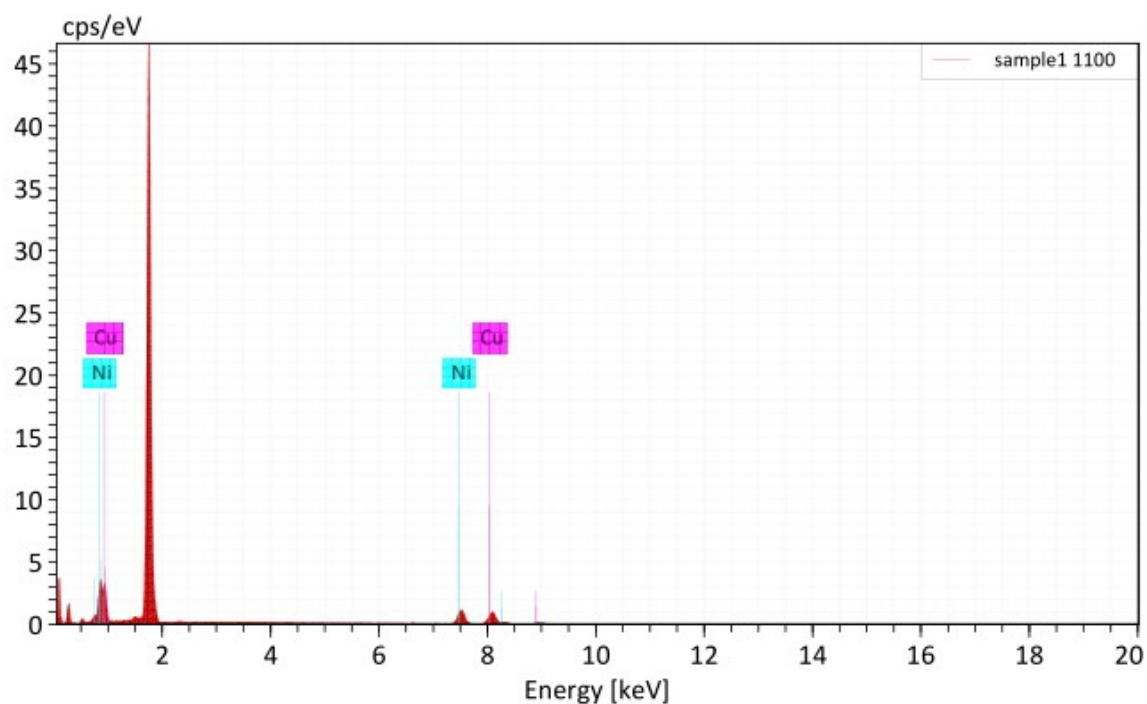


Figure S1. SEM images of Cu/Ni alloy nanospheres obtained using the standard procedure, except that TOP was absent



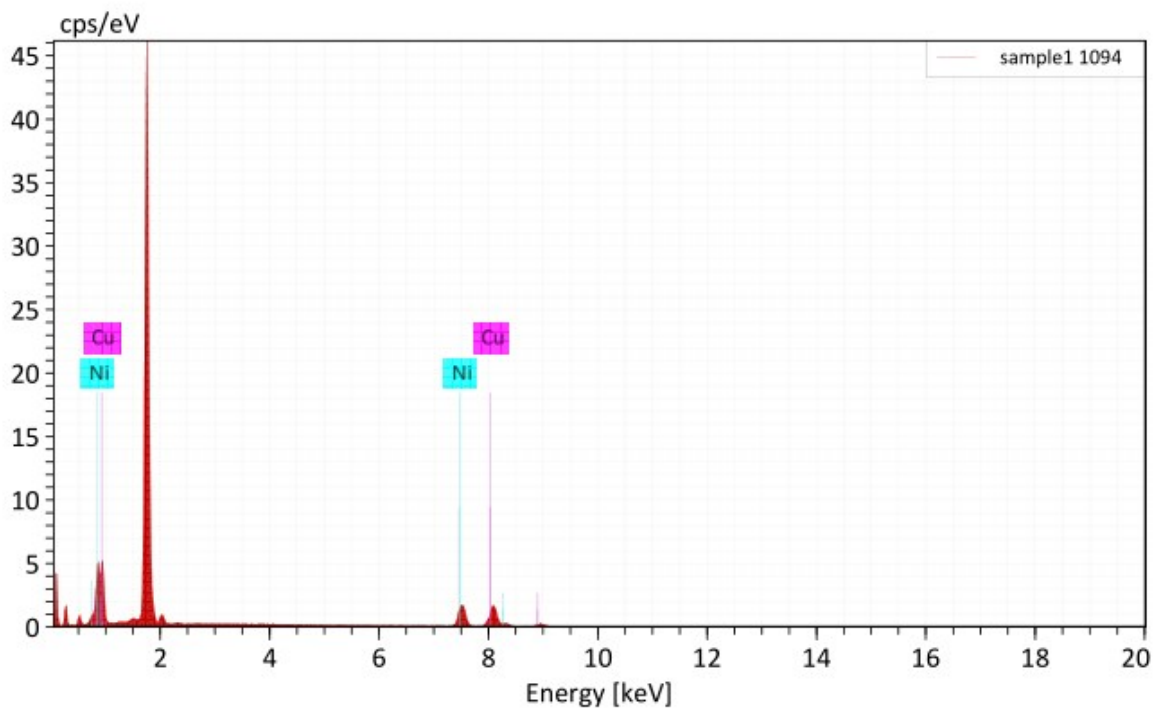
Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	15836	26.41	48.00	49.99	0.77	2.90
Copper	29	13366	28.61	52.00	50.01	0.84	2.93
Sum			55.02	100.00	100.00		

Figure S2. EDS pattern of Cu₅₀Ni₅₀ nanospheres with the diameter of 16.5±1.7 nm.



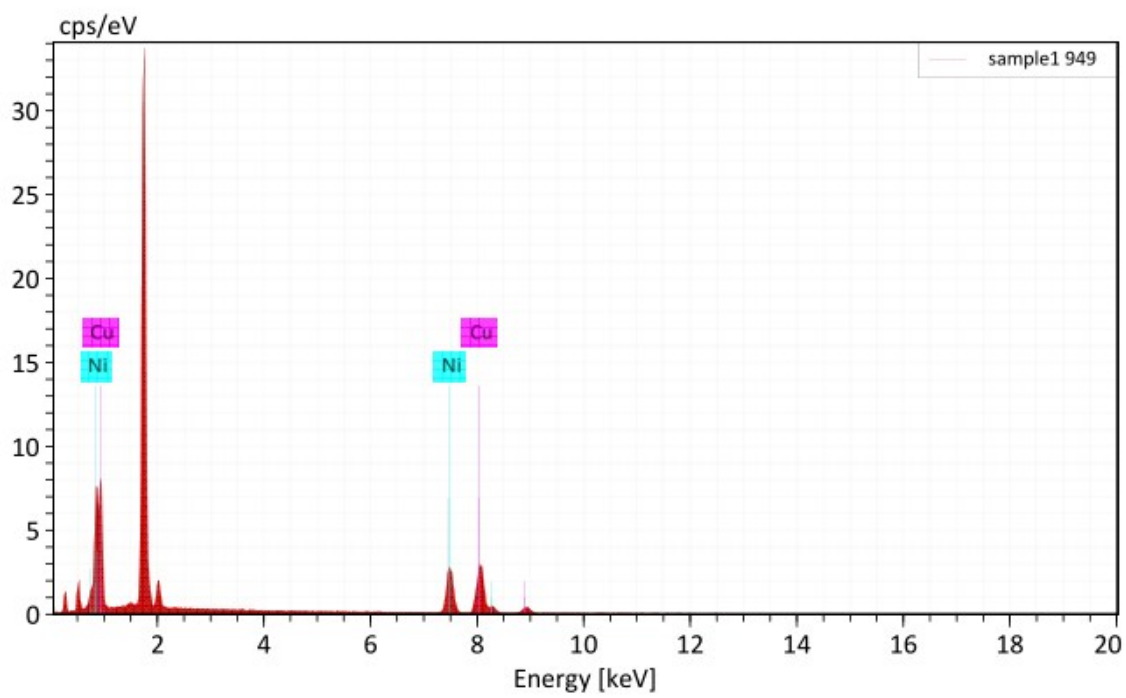
Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	5467	13.48	47.75	49.73	0.44	3.25
Copper	29	4622	14.75	52.25	50.27	0.49	3.32
		Sum	28.23	100.00	100.00		

Figure S3. EDS pattern of Cu₅₀Ni₅₀ nanospheres with the diameter of 6.9±1.9 nm.



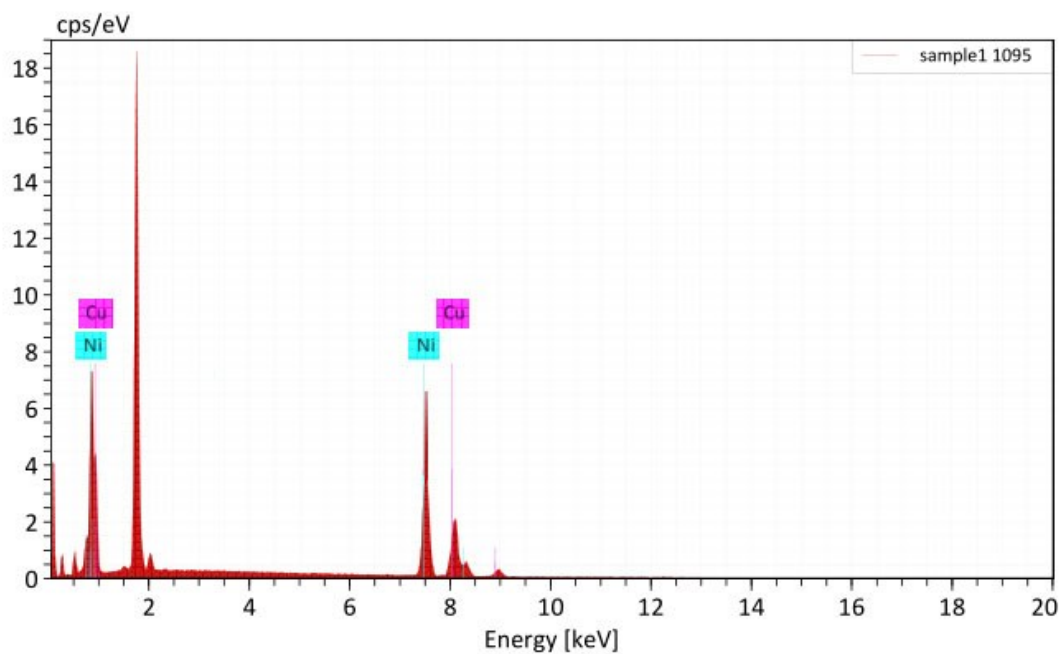
Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	7651	17.84	45.19	47.16	0.55	3.09
Copper	29	7127	21.64	54.81	52.84	0.67	3.11
Sum			39.48	100.00	100.00		

Figure S4. EDS pattern of Cu₅₀Ni₅₀ nanospheres with the diameter of 22.9±2.2 nm.



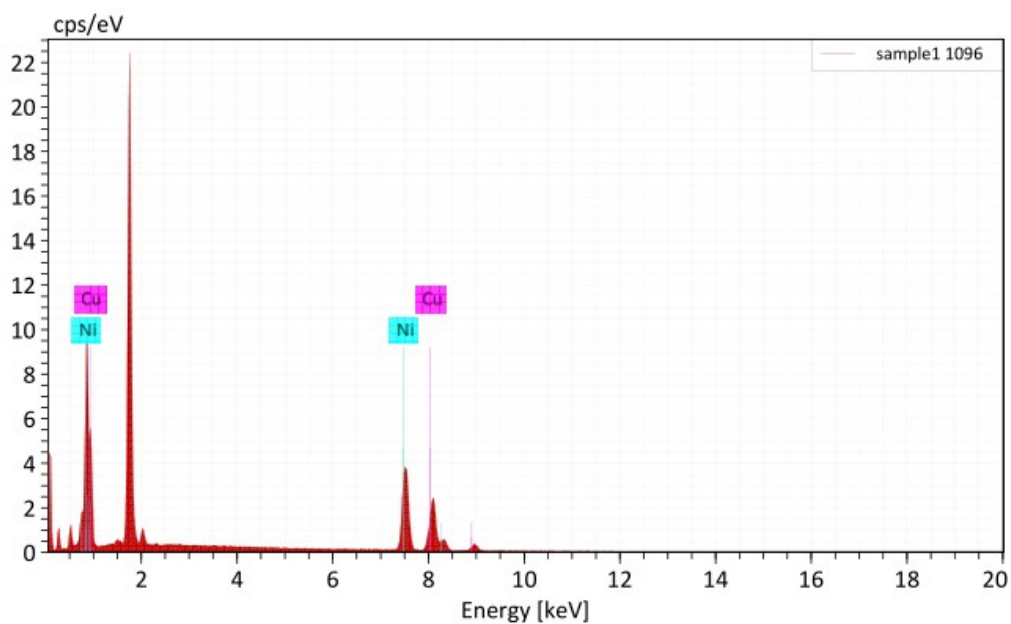
Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	29209	40.78	47.19	49.18	1.14	2.79
Copper	29	25355	45.62	52.81	50.82	1.29	2.82
Sum			86.40	100.00	100.00		

Figure S5. EDS pattern of Cu₅₀Ni₅₀ nanospheres with the diameter of 27.3±2.7 nm.



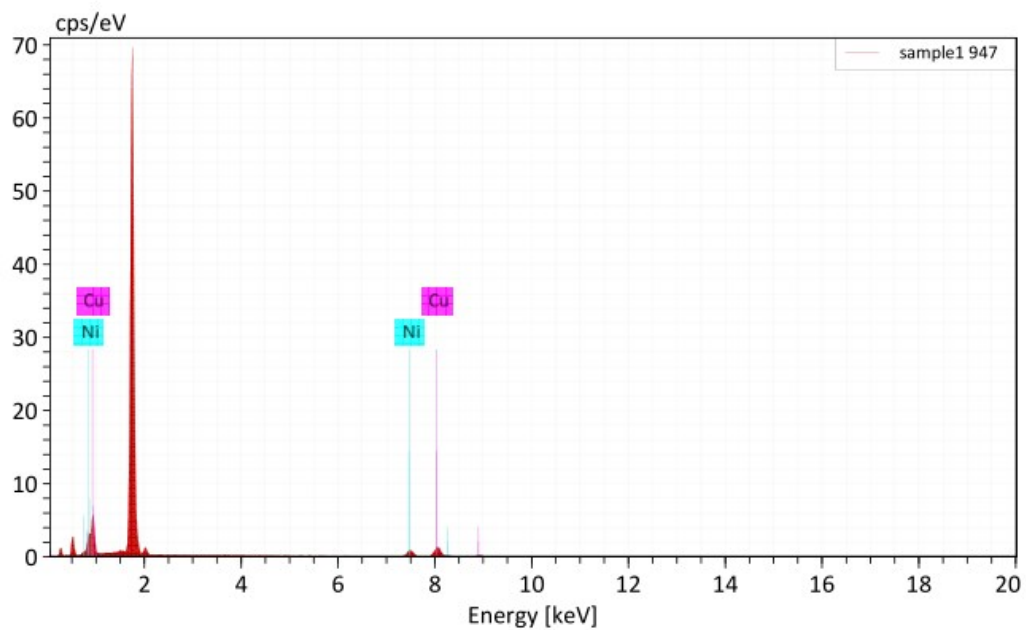
Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	21729	42.02	79.89	81.78	0.91	2.84
Copper	29	11453	11.45	20.11	18.22	0.64	2.99
Sum			53.47	100.00	100.00		

Figure S6. EDS pattern of $\text{Cu}_{20}\text{Ni}_{80}$ nanospheres with the diameter of 18.0 ± 1.0 nm.



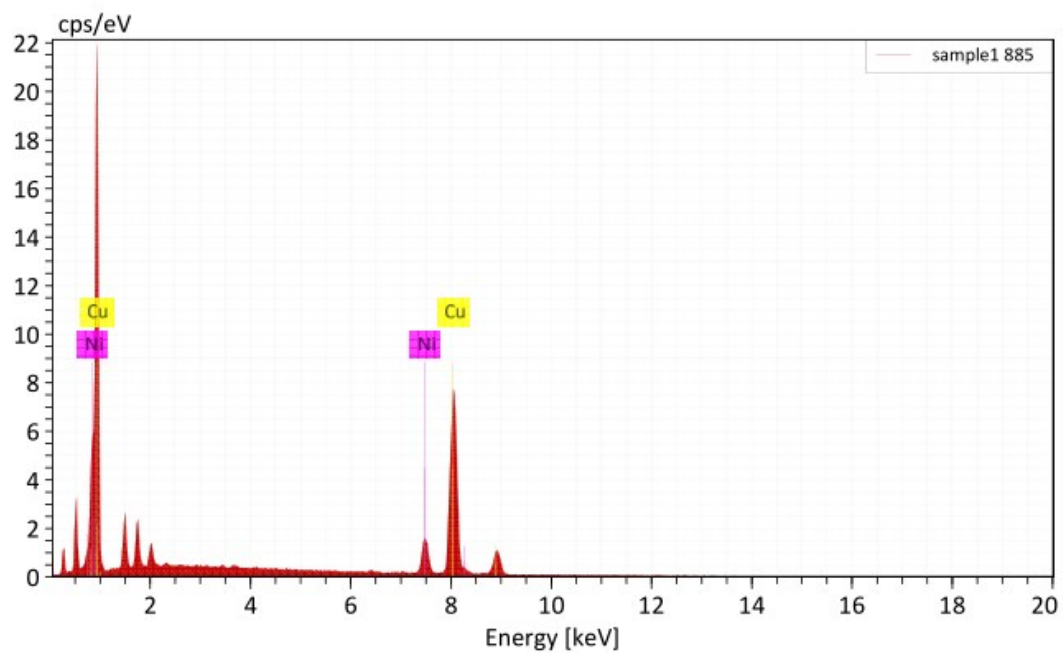
Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	20230	38.32	68.42	66.33	0.98	2.84
Copper	29	11483	20.43	31.58	33.67	0.73	2.98
Sum			58.76	100.00	100.00		

Figure S7. EDS pattern of $\text{Cu}_{33}\text{Ni}_{67}$ nanospheres with the diameter of 16.3 ± 0.6 nm.



Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	3664	11.38	33.32	35.11	0.39	3.46
Copper	29	5644	22.78	66.68	64.89	0.72	3.18
Sum			34.16	100.00	100.00		

Figure S8. EDS pattern of $\text{Cu}_{67}\text{Ni}_{33}$ nanospheres with the diameter of 19.7 ± 1.5 nm.



Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
Nickel	28	8414	13.06	18.99	19.85	0.32	3.18
Copper	29	44730	70.83	81.01	80.15	2.03	2.76
Sum			83.88	100.00	100.00		

Figure S9. EDS pattern of Cu₈₀Ni₂₀ nanospheres with the diameter of 19.7±1.2 nm.

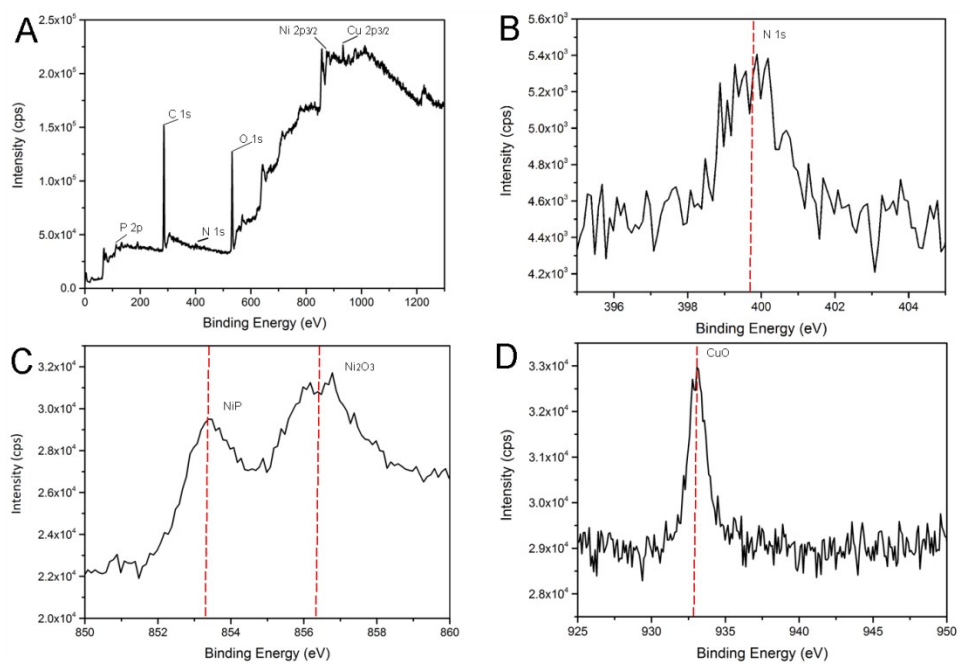


Figure S10. XPS analysis of CuNi (1). (A) survey scan; (B) N 1s spectrum; (C) Ni 2p_{3/2} spectrum; (D) Cu 2p_{3/2} spectrum.

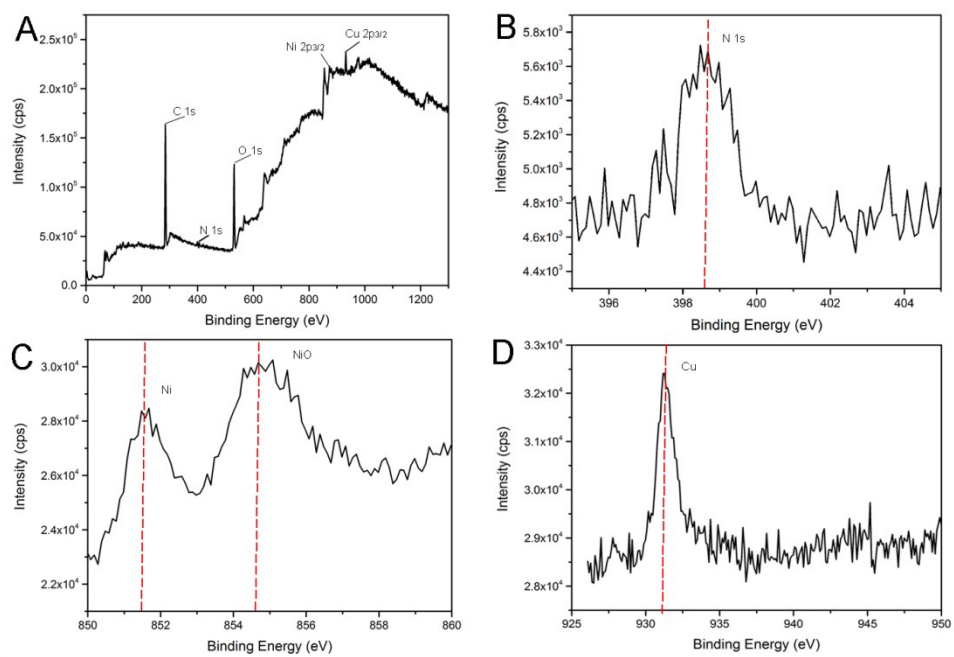


Figure S11. XPS analysis of CuNi (8). (A)survey scan; (B) N 1s spectrum; (C) Ni 2p_{3/2} spectrum o; (D) Cu 2p_{3/2} spectrum.

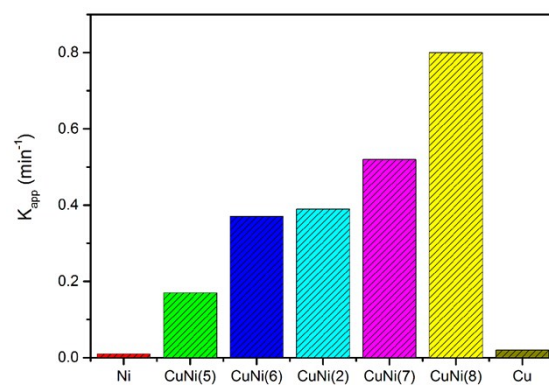


Figure S12. Comparison of apparent reaction rates for reduction of 4-NP when Cu/Ni nanospheres with different elemental compositions were used as catalysts. The k_{app} value of pure Cu catalyst is 0.03 min^{-1} . The k_{app} value of pure Ni catalyst is 0.01 min^{-1} .

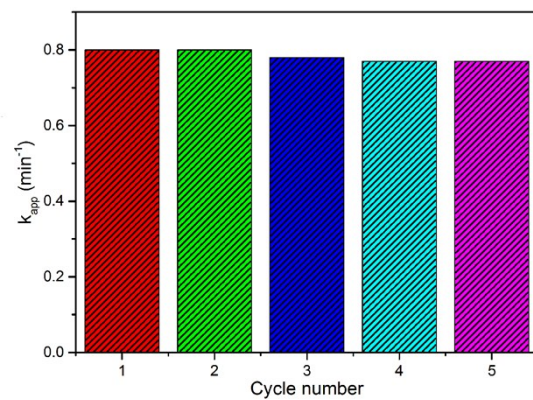


Figure S13. The catalytic performance within five cycles for the reduction of 4-NP catalyzed by CuNi (8).

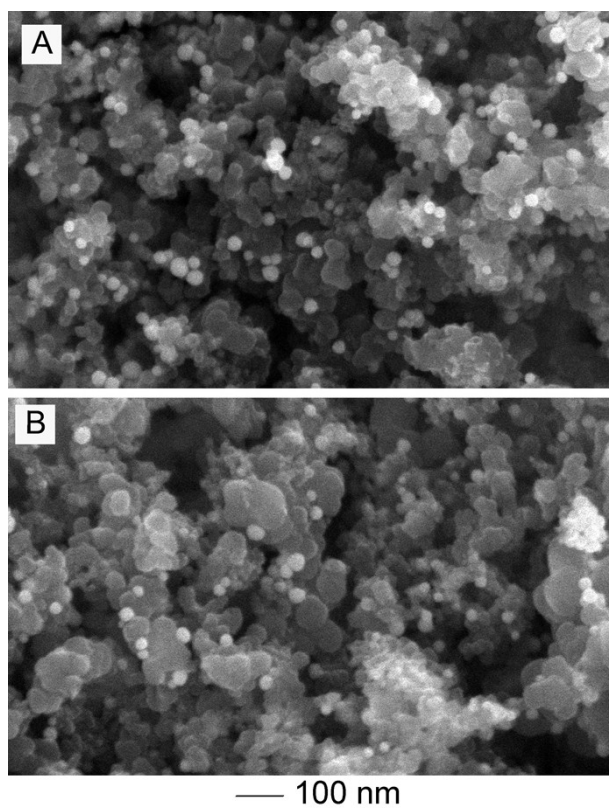


Figure S14. The SEM images of CuNi (8). (A) before five cycle of catalytic reactions; (B) after five cycle of catalytic reactions.

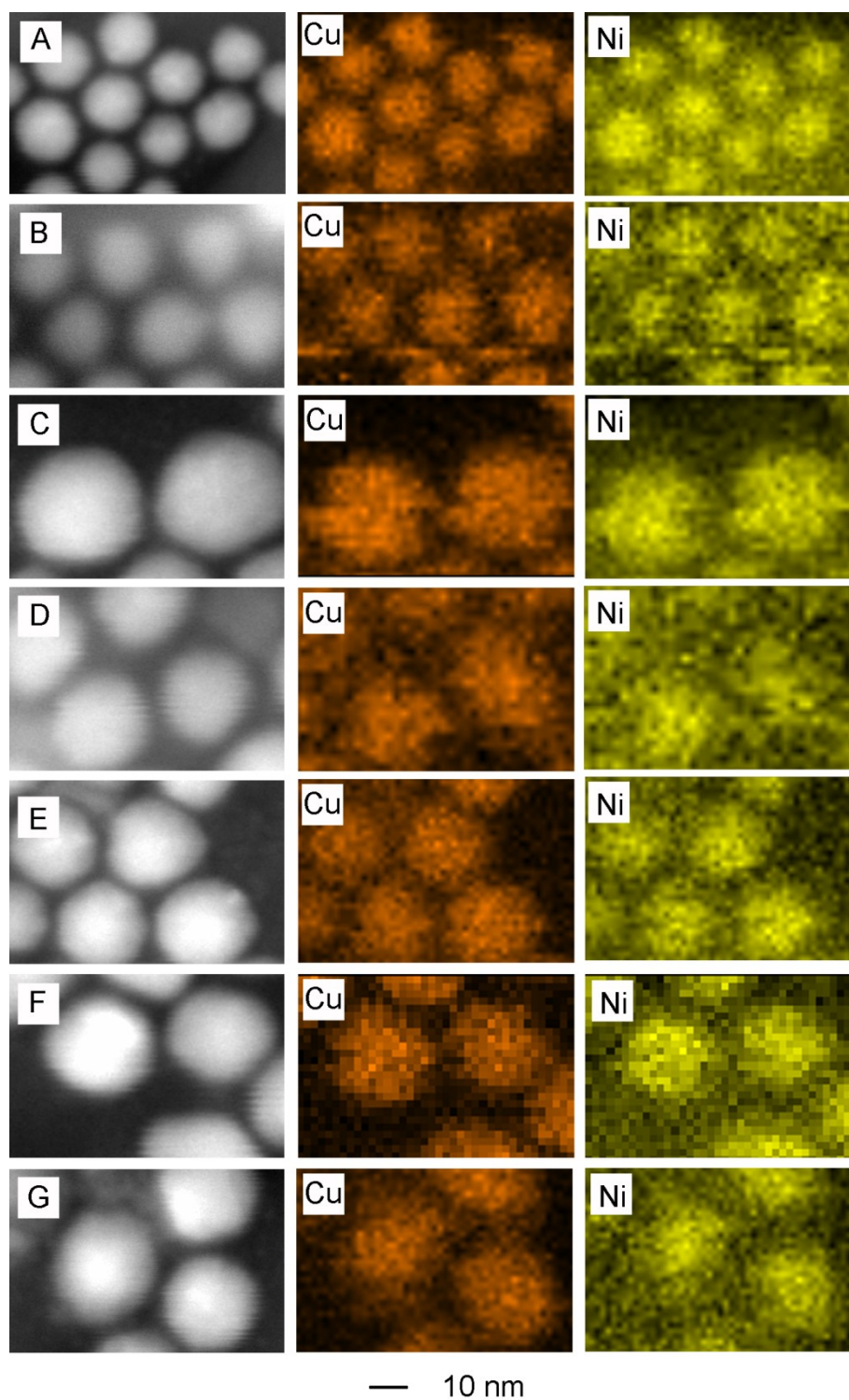


Figure S15. HAADF-STEM and STEM-EDS elemental mapping images of Cu/Ni alloy nanospheres: (A) CuNi (1); (B) CuNi (3); (C) CuNi (4); (D) CuNi (5); (E) CuNi (6); (F) CuNi (7); (G) CuNi (8).

Table S1. AAS analyses of Cu/Ni alloy nanospheres with different sizes and elemental ratios (50% mass loading of total metal) as catalysts before the 4-NP reduction reaction.

	Cu (mg/mL)	Ni (mg/mL)	Cu/Ni nanospheres (mg/mL)
CuNi (1)	1.265	1.177	2.442
CuNi (2)	1.115	1.124	2.239
CuNi (3)	1.133	1.125	2.258
CuNi (4)	1.175	1.031	2.206
CuNi (5)	0.361	1.344	1.705
CuNi (6)	0.490	1.126	1.616
CuNi (7)	1.222	0.594	1.816
CuNi (8)	1.527	0.380	1.907

Table S2. The catalytic performances of alloy nanoparticles to 4-NP in other literatures.

Catalyst	Mass ratio of catalyst to 4-NP	K_{app} (min^{-1})	Ref.
Pt-Ni	1:1	0.37	54
Cu-Ag	5:2	0.42	55
Cu-Ni	50:7	0.89	56
Cu-Ni	1:2.8	0.8	This study