Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

M_xNi_{100-x} (M = Ag, and Co) Nanoparticles Supported on CeO_2 Nanorods Derived from Ce-Metal Organic Frameworks as an Effective Catalyst for Reduction of Organic Pollutants: Langmuir-Hinshelwood Kinetics and Mechanism

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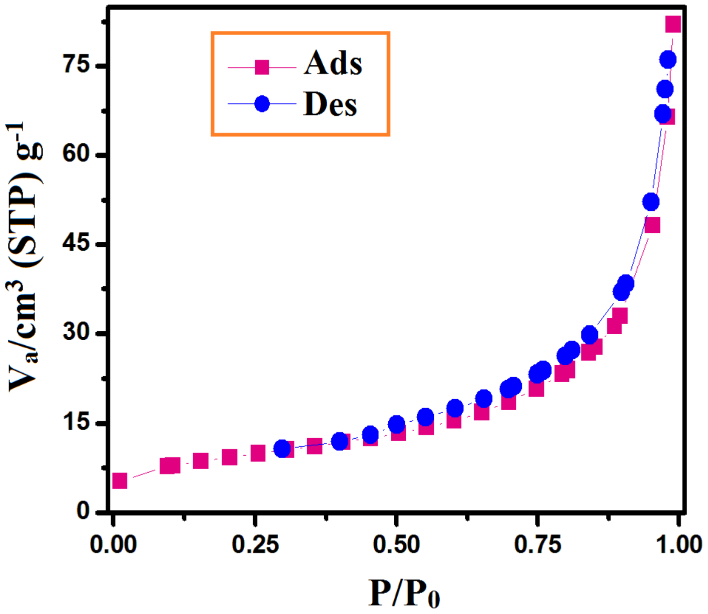

Figure S1. Nitrogen adsorption-desorption isotherms of $Ag_{80}Ni_{20}@CeO_2$ nanocomposite at 77 K.

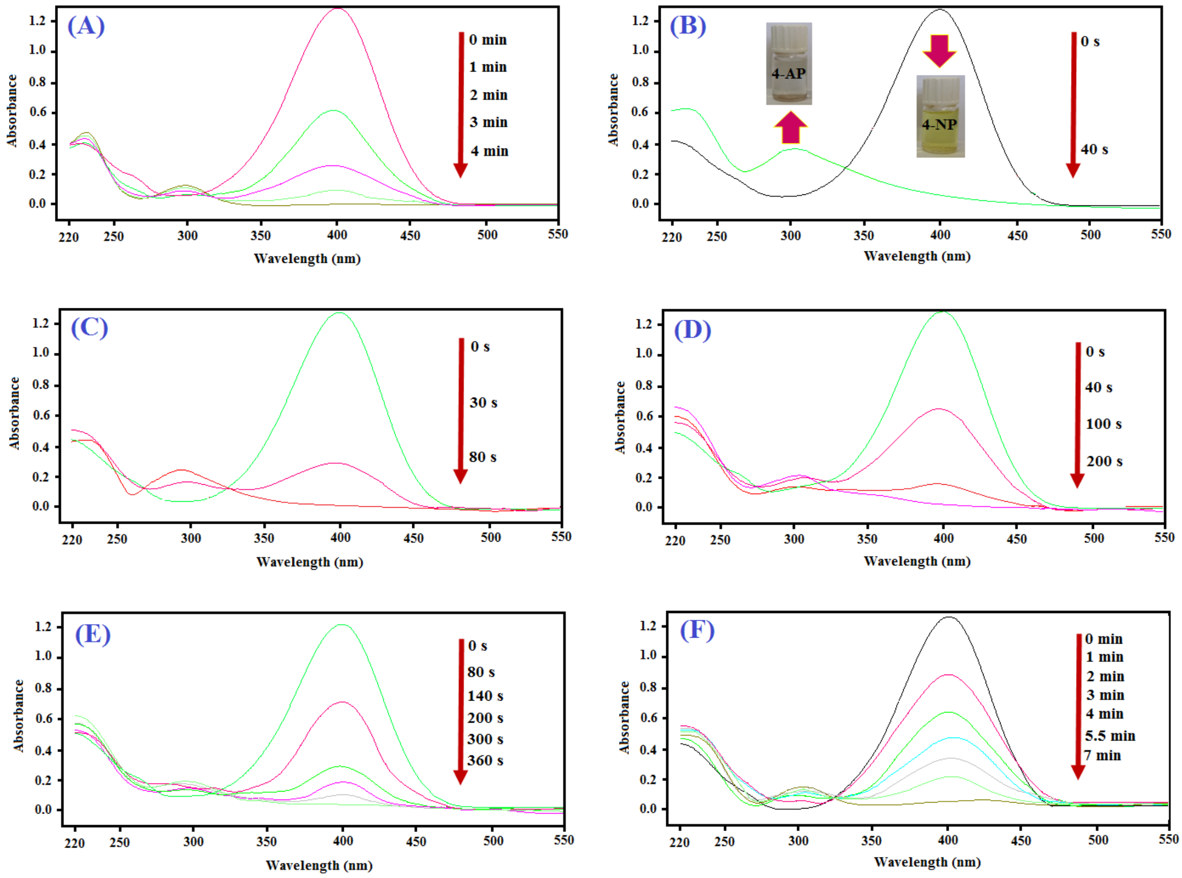

Figure S2. UV-vis absorption spectra of the catalytic reduction of 4-NP by $NaBH_4$ in the presence of: (A) Ag@CeO_2; (B) $Ag_{80}Ni_{20}$@CeO_2; (C) $Ag_{60}Ni_{40}$@CeO_2; (D) $Ag_{40}Ni_{60}$@CeO_2; (E) $Ag_{20}Ni_{80}$@CeO_2, and (F) Ni@CeO_2.

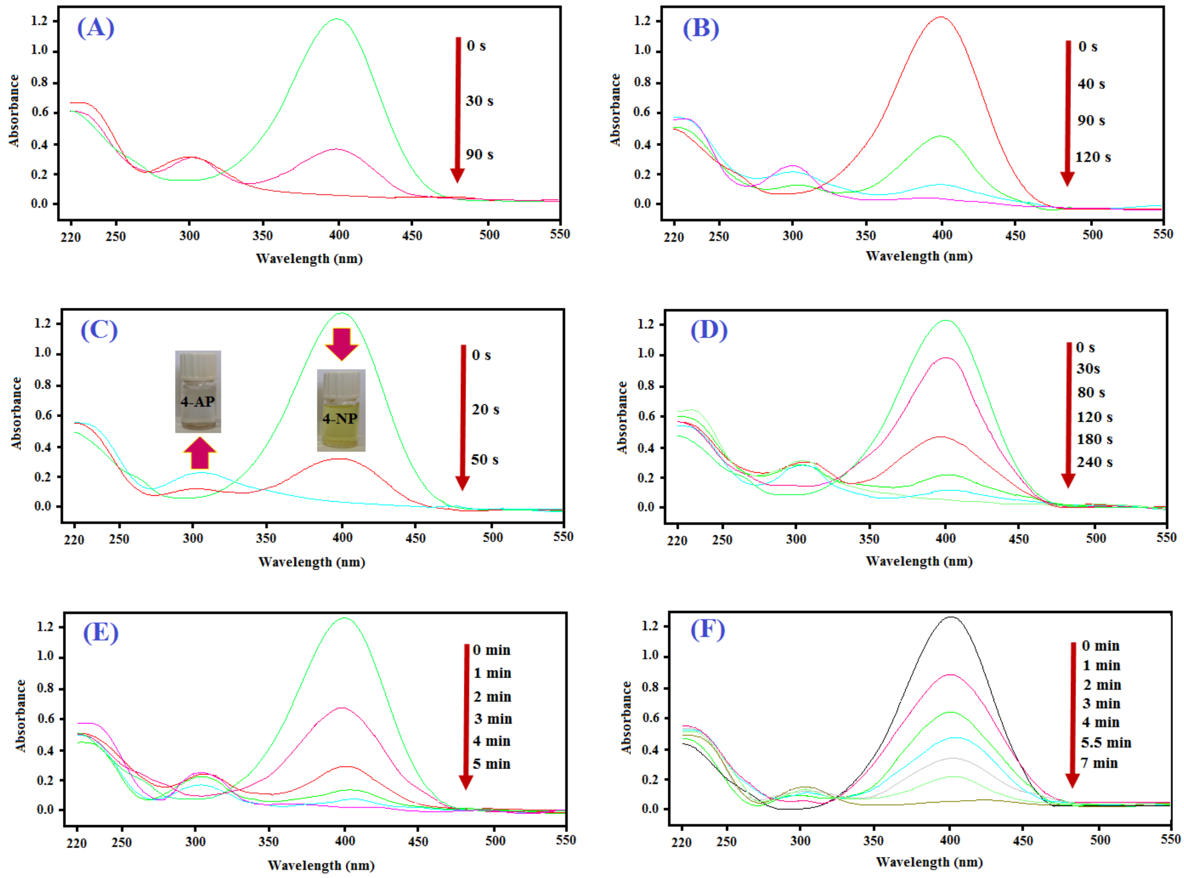

Figure S3. UV-vis absorption spectra of the catalytic reduction of 4-NP by $NaBH_4$ in the presence of: (A) Co@CeO_2; (B) $Co_{80}Ni_{20}$@CeO_2; (C) $Co_{60}Ni_{40}$@CeO_2; (D) $Co_{40}Ni_{60}$@CeO_2; (E) $Co_{20}Ni_{80}$@CeO_2, and (F) Ni@CeO_2.

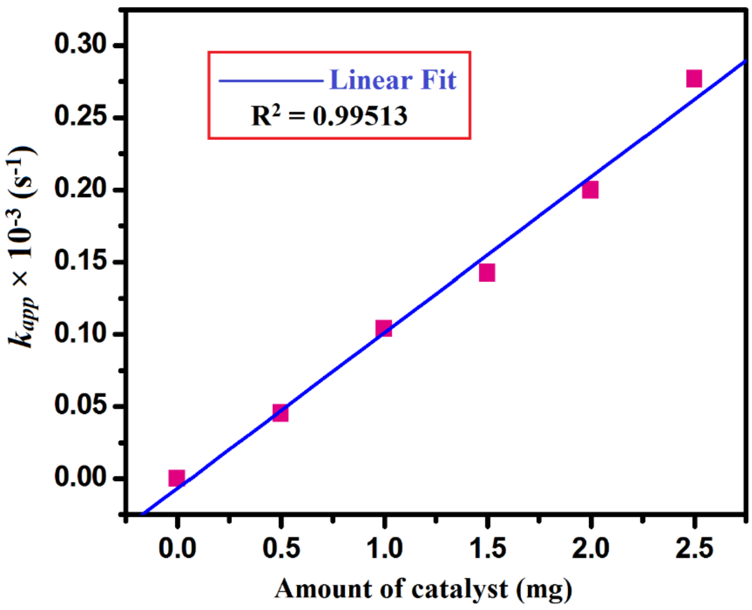

Figure S4. Plot of rate constant (k_{app}) versus amount of $Ag_{80}Ni_{20}@CeO_2$ catalyst at 25 °C, [4-NP] = 0.1 mM, and [$NaBH_4$] = 0.05 M.

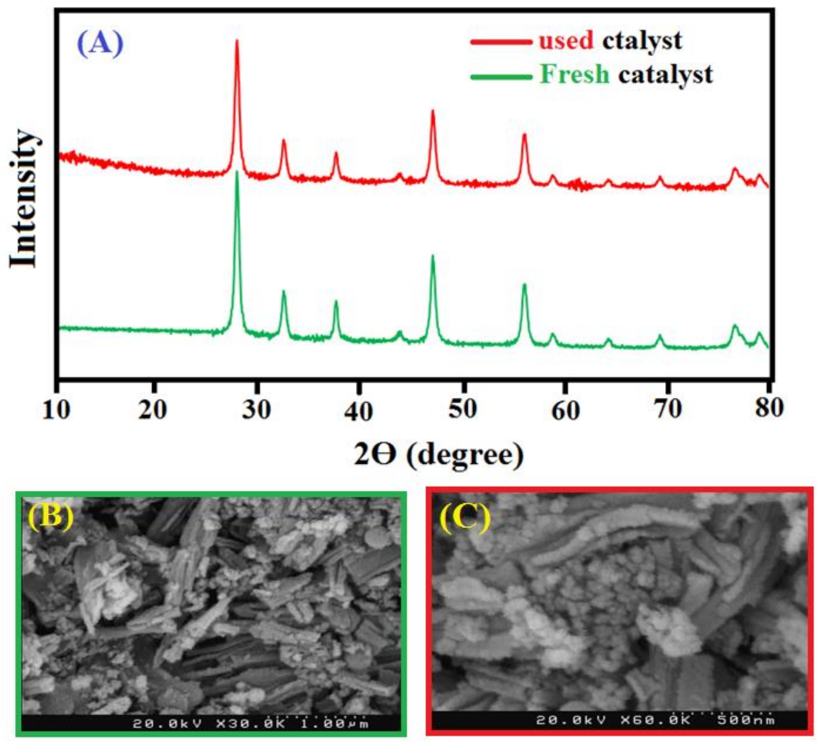

Figure S5. XRD patterns of fresh and used $Ag_{80}Ni_{20}@CeO_2$ catalyst after five runs (A), and SEM images of fresh (B), and used (C) $Ag_{80}Ni_{20}@CeO_2$ nanocomposite after five catalytic runs.

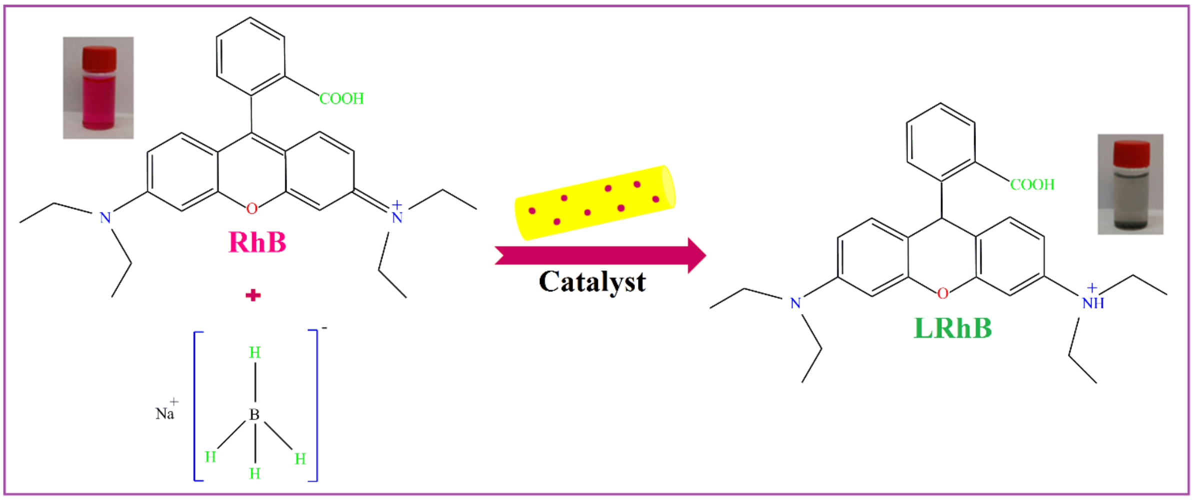

Figure S6. The scheme of transforming RhB to LRhB by as-prepared nanocomposites in the presence of $NaBH_4$ solution.

Table S1. Thermodynamic parameters of 4-NP reduction catalyzed by $Ag_{80}Ni_{20}@CeO_2$ nanocomposite at different temperatures.

Catalyst	T (°C)	$k_{app}\times 10^{-3}$ (s^{-1})	TOF × 10^{19} (molecule g^{-1} min^{-1})	E_a ($kJ\ mol^{-1}$)	A×10^6	ΔH ($kJ\ mol^{-1}$)	ΔS ($J\ mol^{-1}\ K^{-1}$)	ΔG ($kJ\ mol^{-1}$)
	5	27.67	4.817					76.032
	15	58.79	10.323					77.409
$Ag_{80}Ni_{20}@CeO_2$	25	103.85	18.066	40.214	1.076	37.742	-137.735	78.787
	35	171.60	28.905					80.164
	45	245.90	42.508					81.541

Table S2. Thermodynamic parameters of 4-NP reduction catalyzed by $Co_{60}Ni_{40}@CeO_2$ nanocomposite at different temperatures.

Catalyst	T (°C)	$k_{app}\times10^{-3}$ (s^{-1})	TOF × 10^{19} (molecule g^{-1} min^{-1})	E_a ($kJ\ mol^{-1}$)	A×10^6	ΔH ($kJ\ mol^{-1}$)	ΔS ($J\ mol^{-1}\ K^{-1}$)	ΔG ($kJ\ mol^{-1}$)
	5	19.52	3.613					76.851
	15	45.47	8.029					78.079
$Co_{60}Ni_{40}@CeO_2$	25	83.89	14.453	45.170	6.4509	42.699	-122.848	79.307
	35	137.93	24.088					80.536
	45	239.02	42.508					81.764

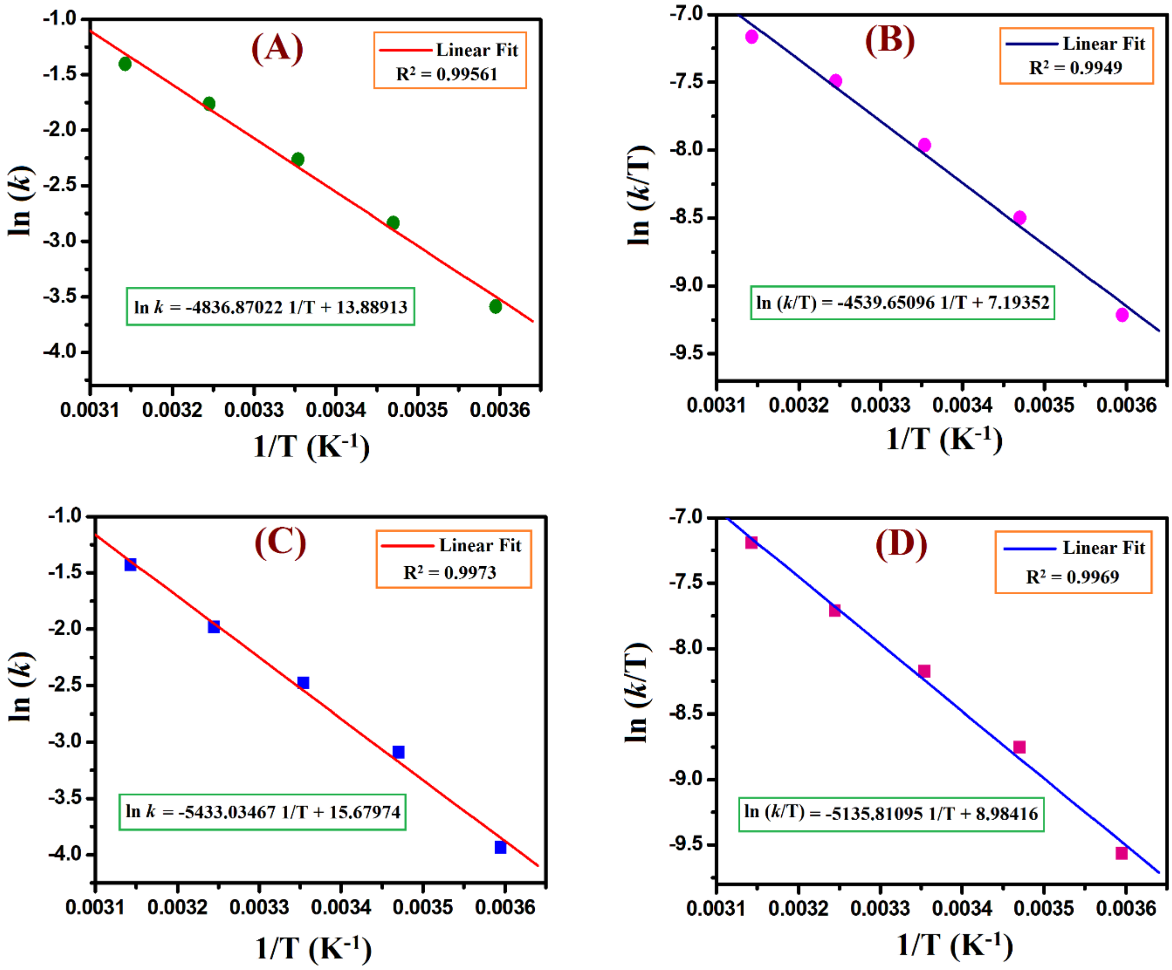

Figure S7. Plots of ln (k), and ln (k/T) versus 1/T, for the 4-NP reduction by $NaBH_4$ in the presence of $Ag_{80}Ni_{20}@CeO_2$ (A, and B), and $Co_{60}Ni_{40}@CeO_2$ (C, and D) nanocomposites.