Supporting Information

Hollow and Mesoporous M@Aluminosilicate (M=Rh, Pd and Pt) Bifunctional Catalytic Nanoreactors for the Hydrodeoxygenation of Lignin-Derived Phenols

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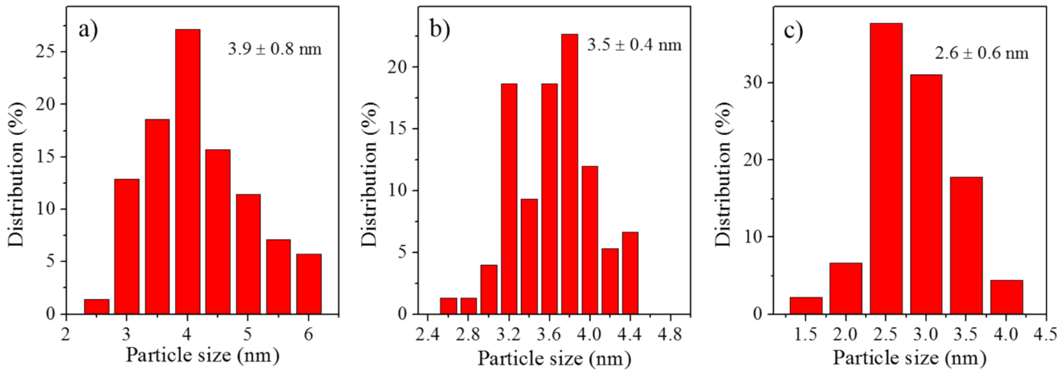

Figure S1. Size distributions showing: (a) Rh@$Al_{2.0}$-mSiO_2, (b) Pt@$Al_{2.0}$-mSiO_2, and (c) Pd@$Al_{2.0}$-mSiO_2.

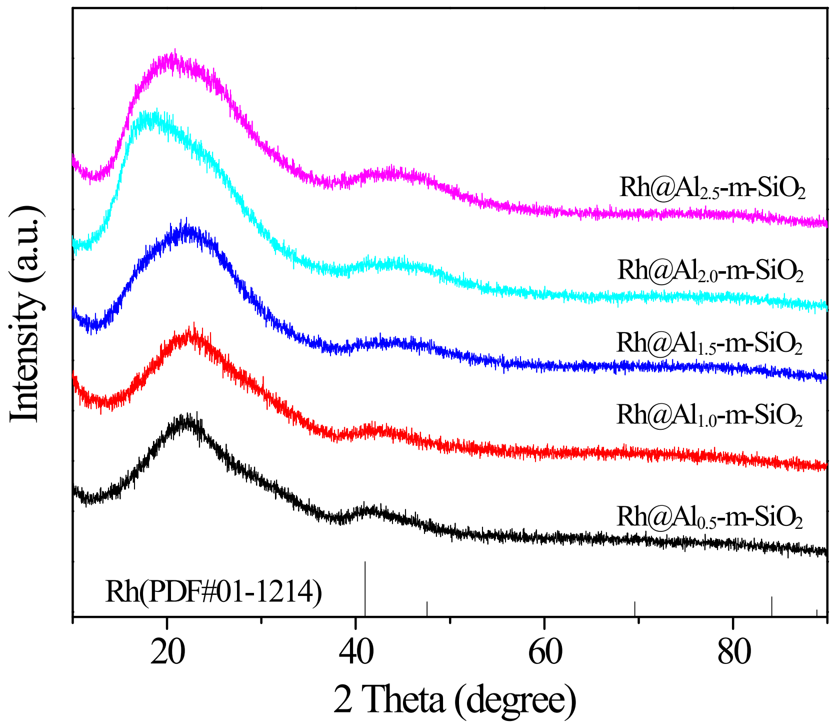

Figure S2. XRD patterns of Rh@$Al_{0.5}$-m-SiO_2, Rh@$Al_{1.0}$-m-SiO_2, Rh@$Al_{1.5}$-m-SiO_2, Rh@$Al_{2.0}$-m-SiO_2, and Rh@$Al_{2.5}$-m-SiO_2.

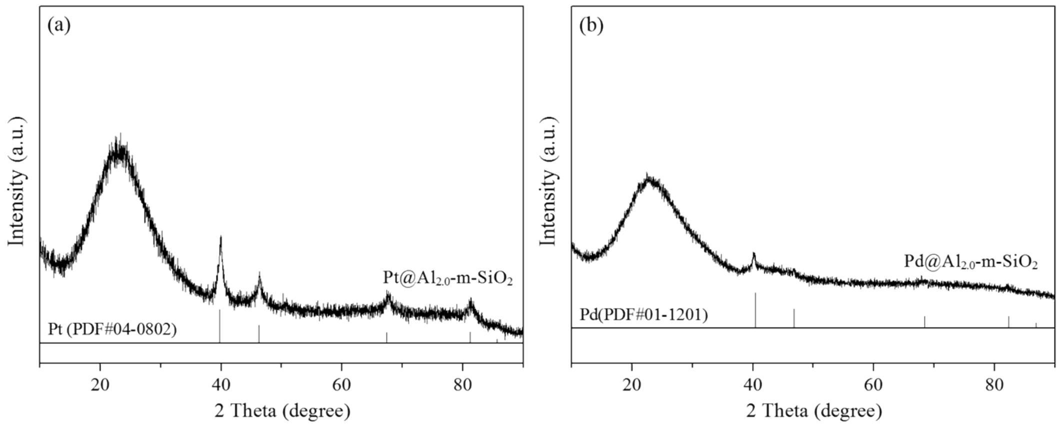

Figure S3. XRD profiles of Pt@Al_2-mSiO_2 and Pd@Al-mSiO_2 samples.

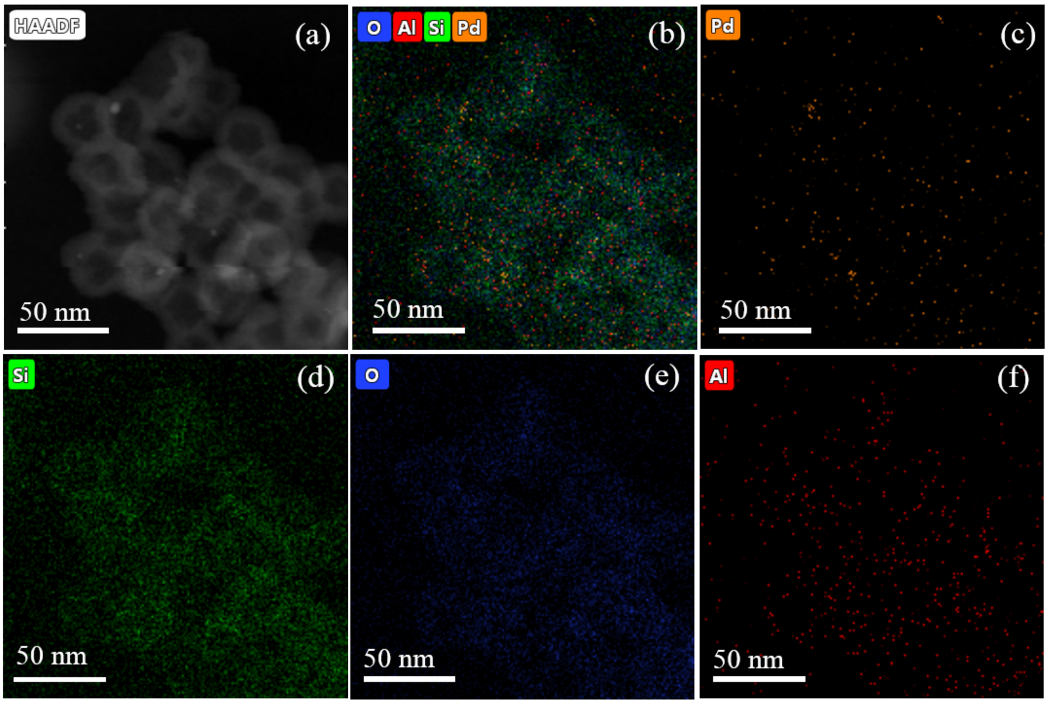

Figure S4. HAADF-STEM images of Pd@Al-mSiO_2 samples: (a) area selected for phase mapping; (b) combined phase mapping of Pd, Si, O and Al; (c) Pd phase mapping; (d) Si phase mapping; (e) O phase mapping; and (f) Al phase mapping.

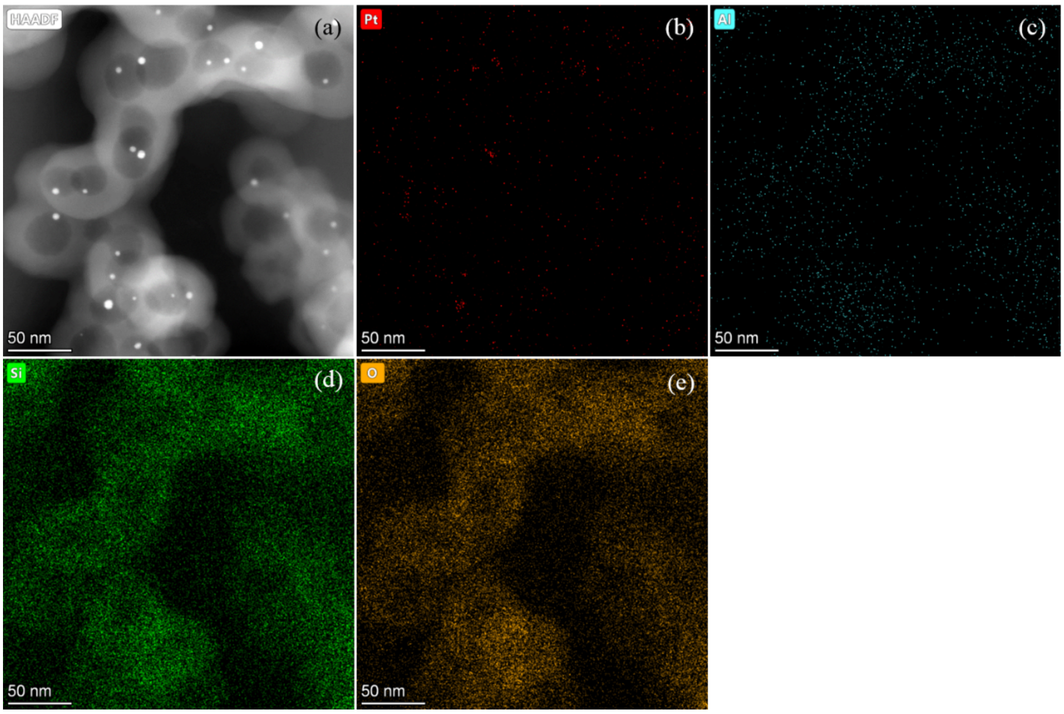

Figure S5. HAADF-STEM images of Pd@Al-mSiO_2 samples: (a) area selected for phase mapping; (b) Pt phase mapping; (c) Al phase mapping; (d) Si phase mapping; and (e) O phase mapping.

Table S1. Physicochemical properties of the samples.

Entry	Catalyst	Rh (wt%)[a]	S_{BET} (m^2·g^{-1})	$D_{poresize}$ (nm)
1	Rh@$Al_{0.5}$-mSiO_2	0.19	664	3.5
2	Rh@$Al_{1.0}$-mSiO_2	0.20	493	4.0
3	Rh@$Al_{1.5}$-mSiO_2	0.19	356	4.0
4	Rh@$Al_{2.0}$-mSiO_2	0.20	328	4.1
5	Rh@$Al_{2.5}$-mSiO_2	0.21	314	4.0

[a] Obtained by ICP-MS method.

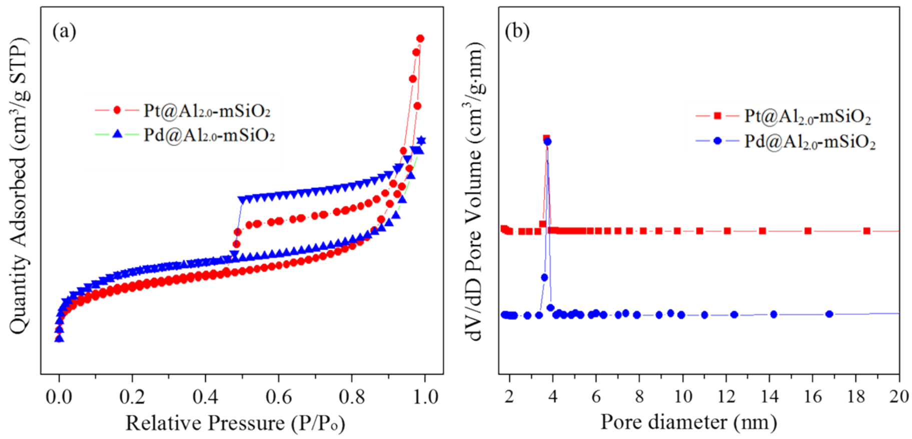

Figure S6. a) N_2 adsorption-desorption isotherms of Pt@$Al_{2.0}$-mSiO_2 and Pd@$Al_{2.0}$-mSiO_2 and b) their corresponding pore size distributions.

Table S2. Acid distributions of the catalysts.

Sample	Temperature (°C)	BA[a] (umol/g)	LA[a] (umol/g)	Total acid (umol/g)
Rh@$Al_{0.5}$-MHSiO_2	200	0.007	0.260	0.267
Rh@$Al_{1.0}$-MHSiO_2	200	0.039	0.200	0.239
Rh@$Al_{1.5}$-MHSiO_2	200	0.097	0.310	0.407
Rh@Al_2-MHSiO_2	200	0.280	0.390	0.670
Rh@$Al_{2.5}$-MHSiO_2	200	0.290	0.360	0.650

[a]BA and LA are the concentration of Brønsted and Lewis acid sites determined by Py-FTIR.

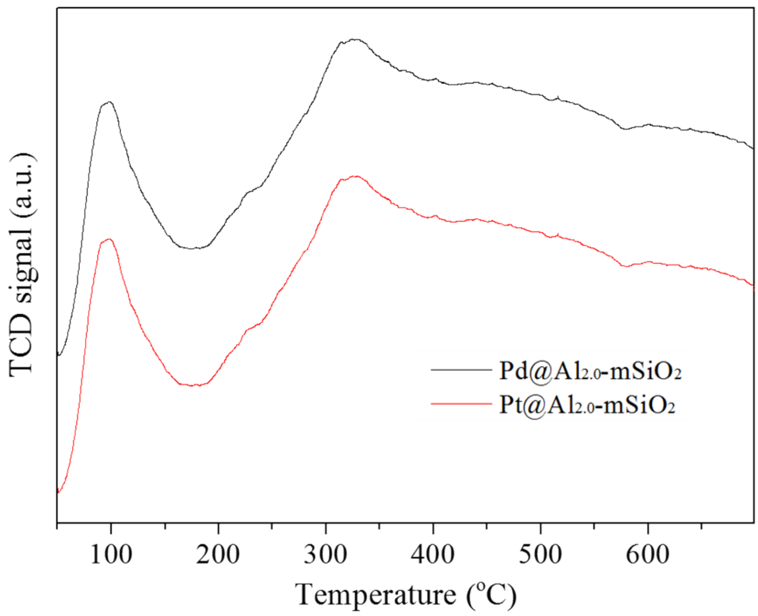

Figure S7. NH_3-TPD profiles of Pd@$Al_{2.0}$-mSiO_2 and Pt@$Al_{2.0}$-mSiO_2 catalysts.

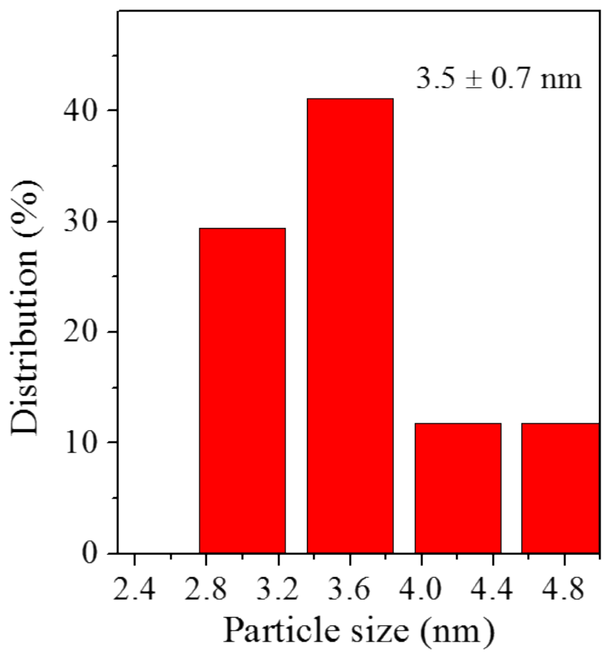

Figure S8. Size distribution of Rh@$Al_{2.0}$-mSiO_2 after five recycling experiments.

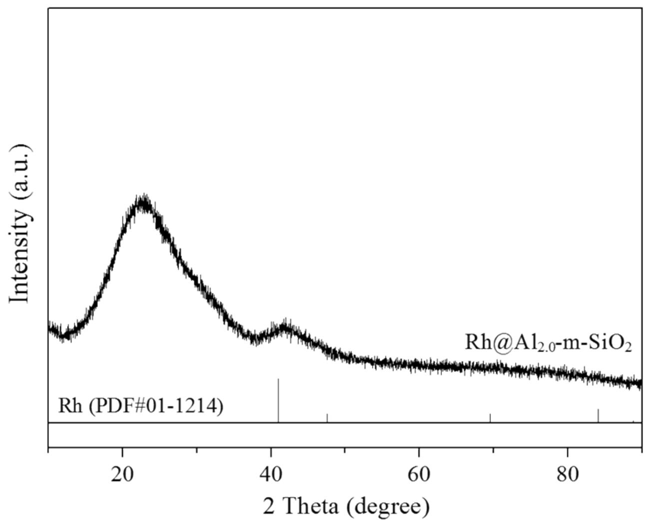

Figure S9. XRD pattern of Rh@$Al_{0.25}$-$mSiO_2$ after five cycle experiments.