

Electronic Supplementary Material (ESI) for New Journal of Chemistry

Hydrotalcite-supported Pd-Au nanocatalysts for Ullmann homocoupling reactions at low-temperature

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Figure S1 Reusability of Pd-Au₃/HT for Ullmann homocoupling of bromobenzene

Reaction conditions: 0.4 mmol bromobenzene, 10 mL isopropyl alcohol, 0.8 mmol KOH, 35 mg catalyst, $T = 40 \pm 1^\circ\text{C}$.

The AAS results of Pd-Au₃/HT after being repeated four times: Pd 0.49 wt%, Au 2.90 wt%, Au:Pd molar ratio=3.20:1

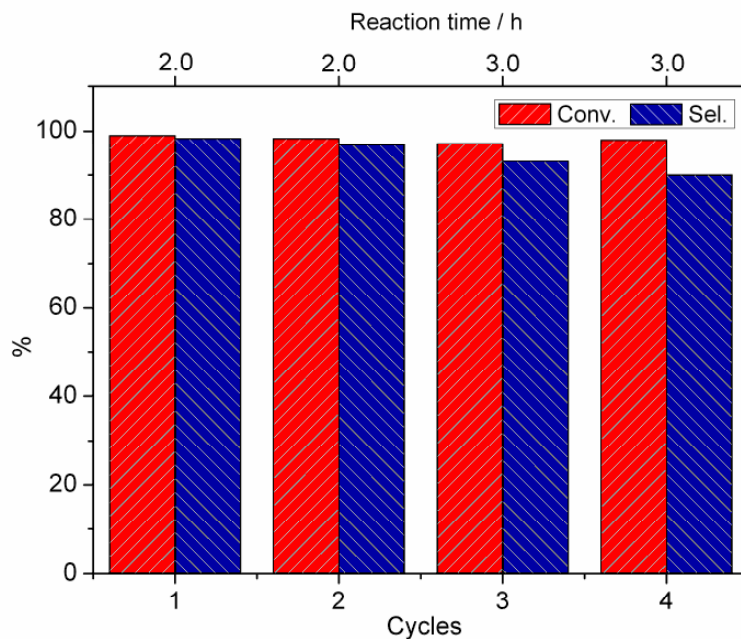


Figure S2 TEM image and the particle size distribution of Pd-Au₃/HT after being repeated four times

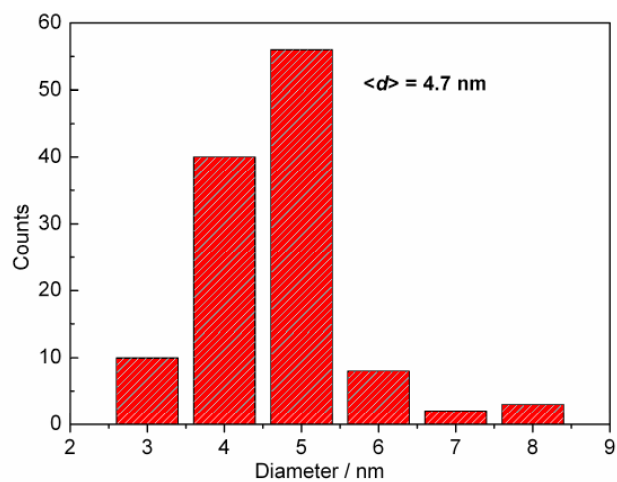
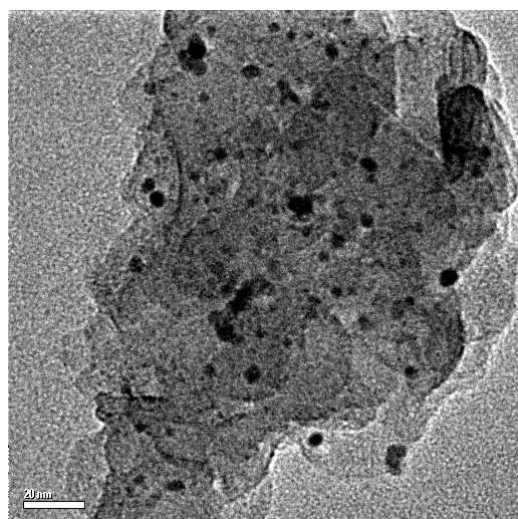
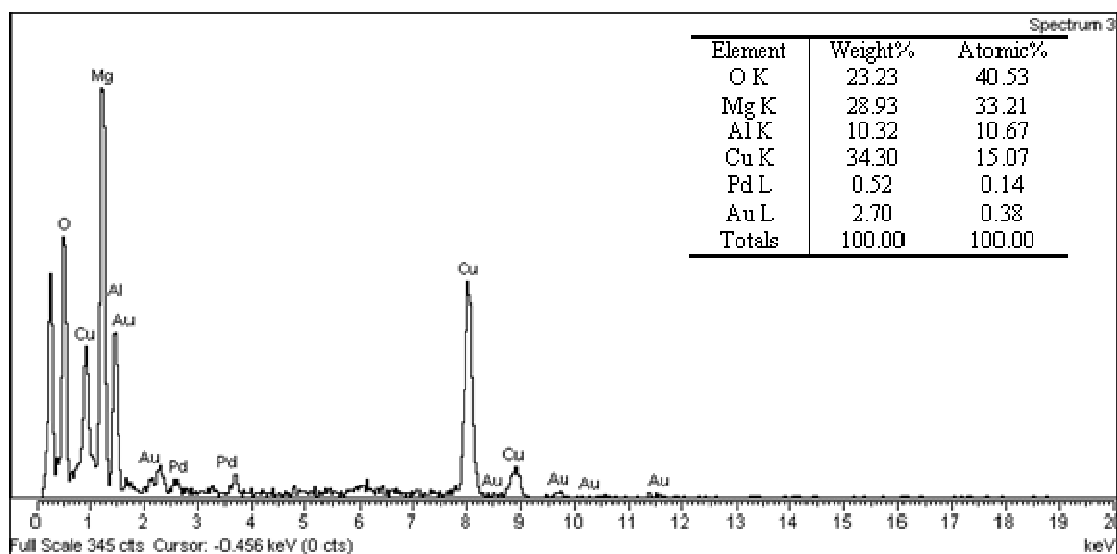


Figure S3 EDX spectrum of Pd-Au₃/HT.



The AAS results of Pd-Au₃/HT: Pd 0.51 wt%, Au 2.81 wt%, Au:Pd molar ratio=2.96:1

Figure S4 XRD patterns of the catalysts. (a) HT, (b) Pd-Au₃/HT, (c) Pd-Au_{0.5}/HT, (d) Au/HT, (e) Pd/HT.

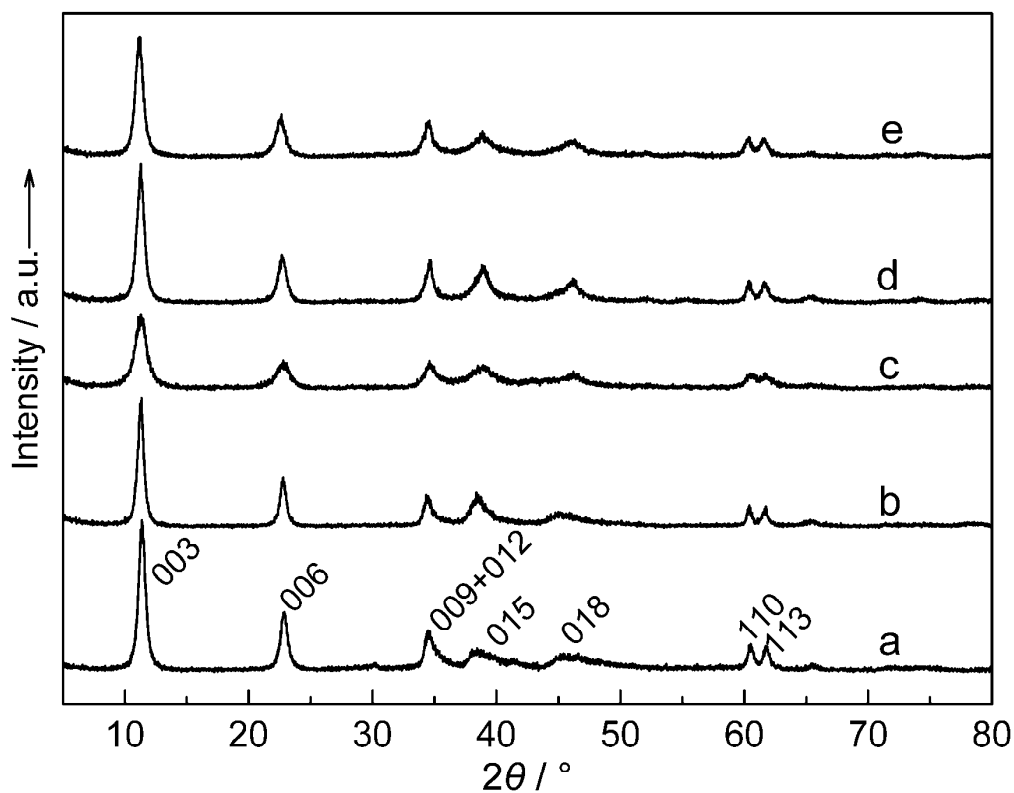


Figure S5 UV-Vis absorption spectra of (a) HT, (b) Au/HT, (c) Pd-Au₃/HT, (d) Pd-Au_{0.5}/HT, (e) Pd/HT.

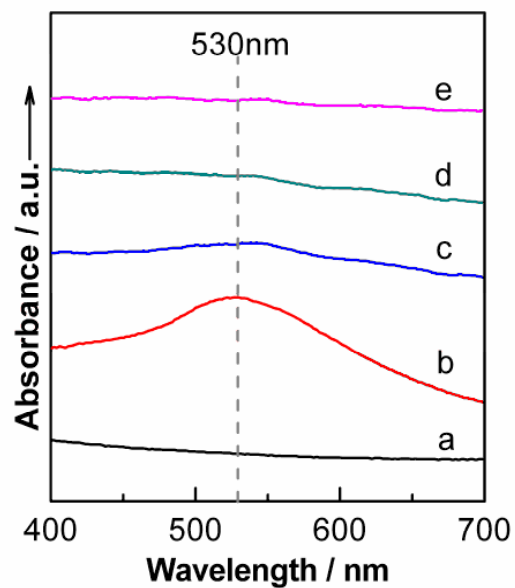


Figure S6 The relationship between conversion of bromobenzene and amount of KOH. (Reaction conditions: 0.4 mmol bromobenzene, 10 mL isopropyl alcohol, 35 mg Pd-Au₃/HT, 2 h reaction time and $T=40\pm 1$ °C)

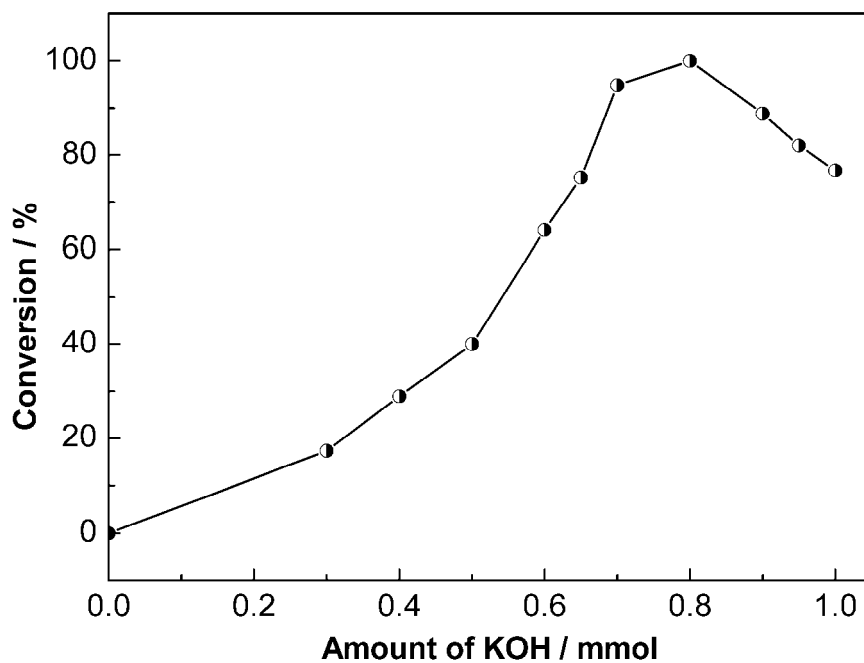


Table S1 Lattice parameters by determined from XRD data of the catalysts.

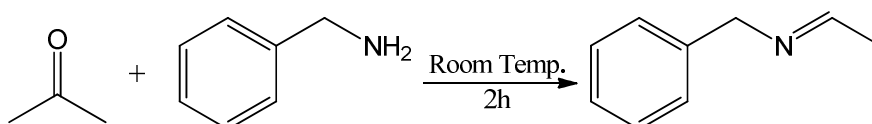
Catalyst	d_{003} (nm)	d_{110} (nm)	a (nm) ^a	c (nm) ^a
HT	0.777	0.153	0.306	2.331
Pd-Au ₃ /HT	0.774	0.153	0.306	2.322
Pd-Au _{0.5} /HT	0.775	0.153	0.306	2.325
Au/HT	0.776	0.153	0.306	2.328
Pd/HT	0.776	0.153	0.306	2.328

^a a ($a = 2d_{110}$) and c ($c = 3d_{003}$).

Table S2 Ullmann homocoupling of bromobenzene with different base^a.

Entry	Base (0.8mmol)	Time (h)	Conv. (%)	Yield (%)
1	KOH	10	>99	81.2
2	CH ₃ CH ₂ ONa	10	63.5	44.5
3	K ₂ CO ₃	10	2.1	1.7
4	NaOAc	10	Trace	Trace

^a Reaction conditions: 0.4 mmol bromobenzene, 10 mL isopropyl alcohol, 35 mg Pd-Au_{0.5}/HT and $T=40 \pm 1^\circ\text{C}$.

Scheme S1. Quantitative detection of acetone

The GC peak of acetone is overlapped with that of isopropyl alcohol. We use the nucleophilic addition of acetone with benzyl amine to detect quantitatively the amount of imine as shown in Scheme S1. The results are shown that the mole ratio of the producing acetone and reactive bromobenzene approaches to 1:1.