

## Supplementary Information

A mild solution chemistry method to hydrotalcite-supported Platinum nanocrystals for selective hydrogenation of cinnamaldehyde in neat water

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**Table S1** Description of the synthesized catalysts and Pt loading

Sample name	TTAB/Pt <sup>4+</sup> ratio	Pt loading % (wt) <sup>a</sup>
Pt/MA	0	1.97
Pt/MA-1	25: 1	1.96
Pt/MA-2	50: 1	1.96
Pt/MA-3	100: 1	1.97

<sup>a</sup> As determined by ICP

**Table S2** The effect of solvents on catalytic performance over the Pt catalyst<sup>a</sup>

Solvent	TOF (s <sup>-1</sup> ) <sup>b</sup>	Conversion%	Selectivity % <sup>c</sup>			
			CMO	HCMA	HCMO	Others <sup>d</sup>
Water	0.488	79.7	85.4	13.3	1.0	0.3
Ethanol	0.600	84.7	91.2	1.3	2.2	5.3
Isopropanol	0.593	80.6	88.4	4.7	2.0	4.9
Cyclohexane	0.139	25	43.8	41.4	10.6	4.2

<sup>a</sup> Pt/MA-1. <sup>b</sup> TOF was calculated at CAL conversion of approximately 10%. <sup>c</sup> Selectivity was reported at the level of conversion in the table. <sup>d</sup> Other products mainly include acetals. Reaction conditions: 0.05 g catalyst, substrate: 4 mmol CMA, solvent: 15 mL, H<sub>2</sub> pressure: 1.0 MPa, temperature: 333 K, reaction time: 2 h.

**Table S3** The polarity and H<sub>2</sub> solubility in different solvents <sup>1</sup>

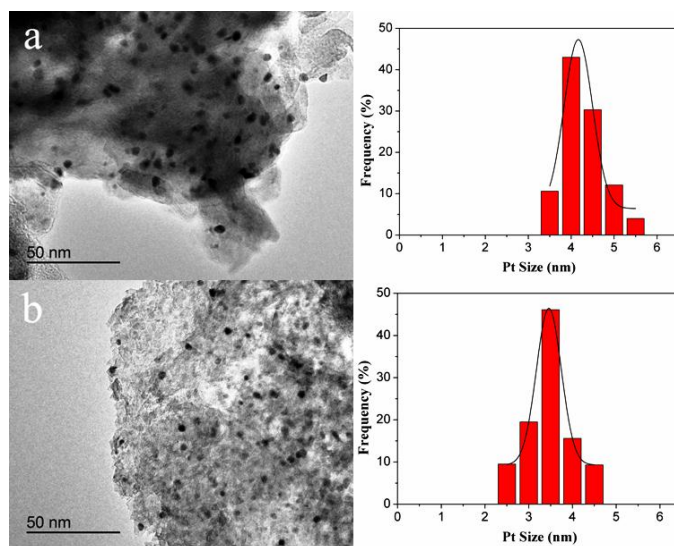
Solvent	Polarity	H <sub>2</sub> solubility <sup>a</sup> / $\mu\text{mol cm}^{-3}$
Water	23.4	0.80
Ethanol	12.9	3.59
Isopropanal	11.5	3.90
Cyclohexane	0.2	3.72

<sup>a</sup> The H<sub>2</sub> solubility ( $c_L$ ) is related to the Bunsen coefficient ( $a$ ) by  $c_L = a/v_0$ , where  $v_0$  is the molar volume of the gas in  $\text{cm}^3 \text{mol}^{-1}$  at 273.15 K,  $a$  is calculated at 293.15 K and 101.325 kPa partial pressure of the gas.

**Table S4** Citral hydrogenation over the supported Pt catalyst <sup>a</sup>

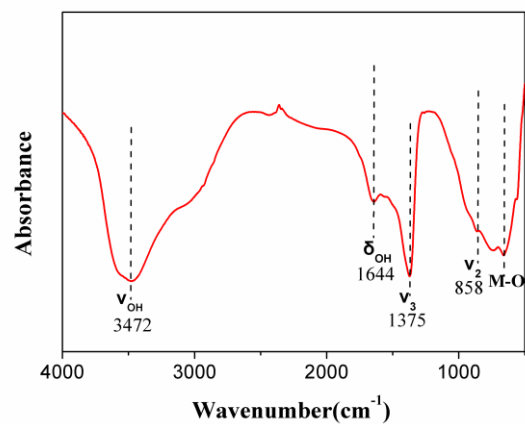
Temp (K)	Conversion%	geraniol (C=O)	Selectivity % <sup>b</sup>	
			citronellal (C=C)	citronellol (C=C-C=O)
373	96.3	12.8	1.4	84.2
353	95.0	38.9	2.5	49.9
333	91.5	70.5	3.1	20.3

<sup>a</sup> Catalyst: Pt/MA-1. <sup>b</sup> Selectivity was reported at the level of conversion in the table. Reaction conditions: 0.05 g catalyst, substrate: 2.9 mmol citral, solvent: 15 mL water, H<sub>2</sub> pressure: 1.0 MPa, reaction time: 2 h.

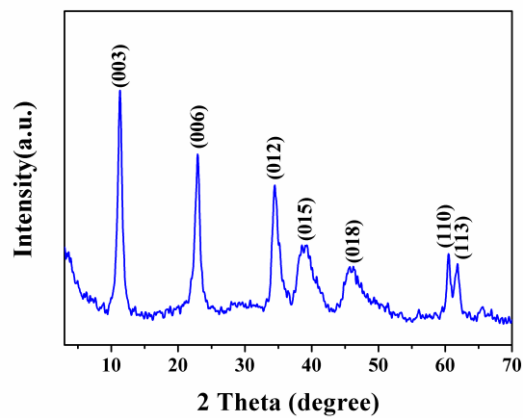


**Figure S1** TEM photographs of the supported Pt catalysts with reduced Pt loadings

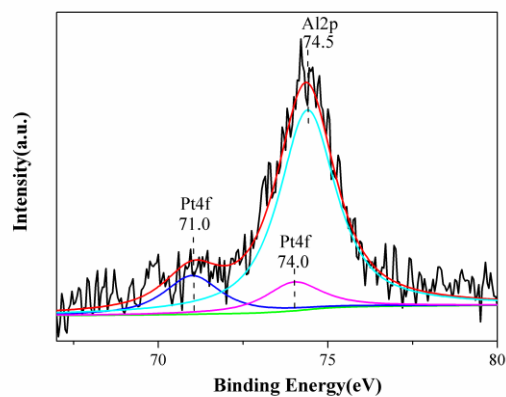
(a) 0.96 wt% Pt, (b) 0.47 wt% Pt. Pt size distribution histograms were shown in the right column.



**Figure S2** FTIR spectra of the supported Pt catalyst (Pt/MA-1) after use



**Figure S3** XRD pattern of supported Pt catalyst (Pt/MA-1) after use



**Figure S4** XPS spectra of Pt4f core level in the catalyst (Pt/MA-1) after use

## References

- 1 C. L. Young, Hydrogen and Deuterium, Pergamon, Solubility data series, 1981, Volume 5/6.