

## SUPPORTING INFORMATION for Manuscript

### Efficient Low-Temperature H<sub>2</sub> Production from HCOOH/HCOO<sup>-</sup> by [Pd<sup>0</sup>@SiO<sub>2</sub>-Gallic-Acid] Nanohybrids: Catalysis and the Underlying Thermodynamics & Mechanism

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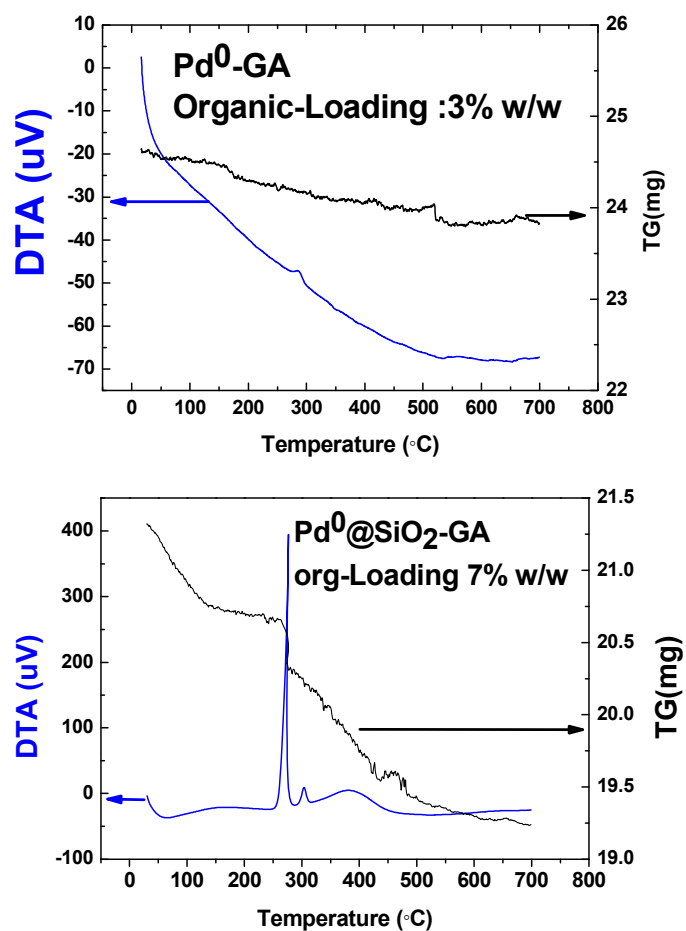
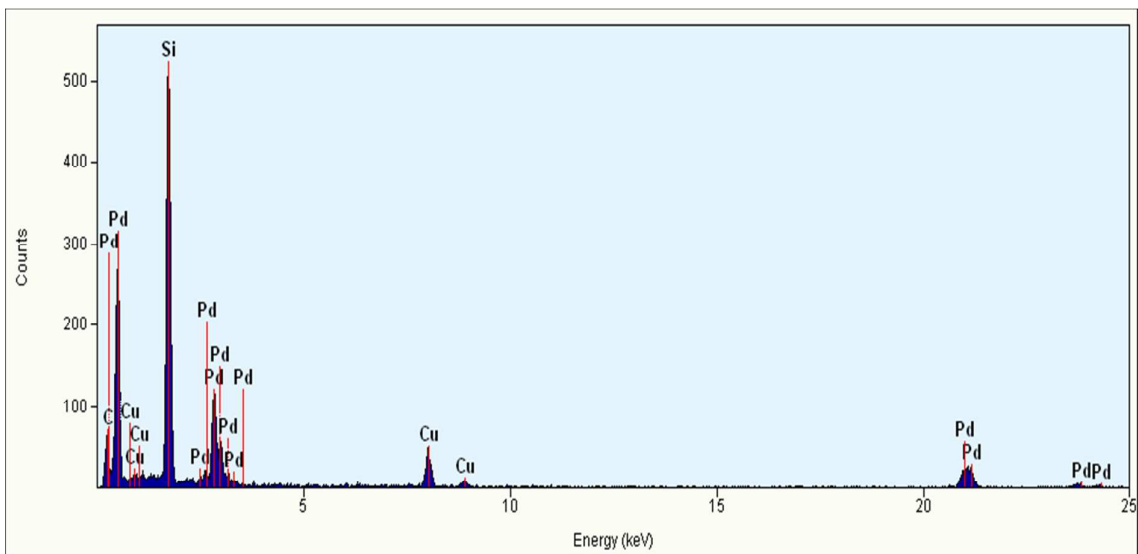
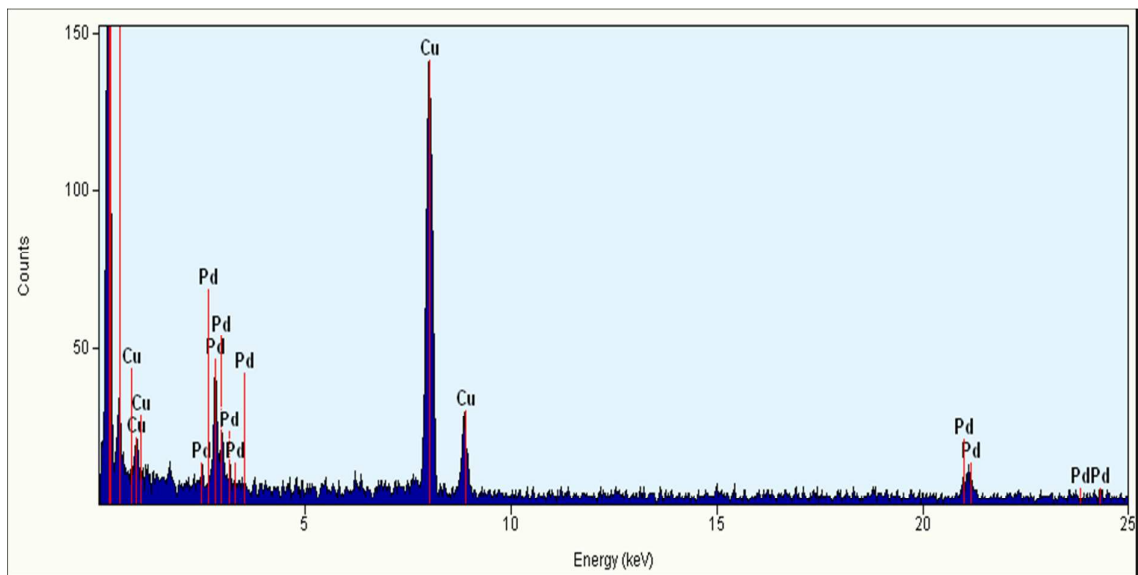
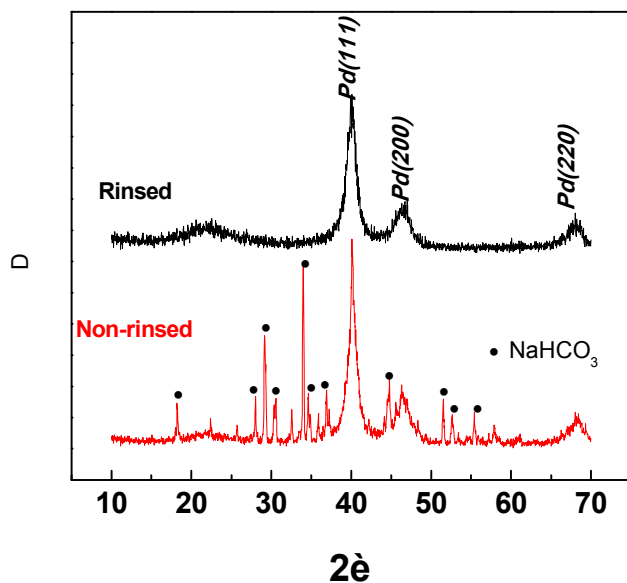


Figure S1. Thermographs of the Pd<sup>0</sup>-GA and Pd<sup>0</sup>@SiO<sub>2</sub>-GA materials



**Figure S2.** EDS spectra of the prepared nanocatalysts (A) Pd<sup>0</sup>-GA (top) (B) Pd<sup>0</sup>@SiO<sub>2</sub>-GA (bottom).

## XRD analysis of the particles after catalytic use



**Figure S3.** XRD patterns of Pd<sup>0</sup>@SiO<sub>2</sub>-GA after use in catalytic reaction (red line). Significant amounts of NaHCO<sub>3</sub> have been deposited on the particles as results of the catalytic cycle, see Scheme-2. These carbonates could be washed out by a simple rinsing with water (black line).

### Calculation of the Pd-atoms exposed on the particle surface

$$\text{particle surface} = 4\pi \left( \frac{d_{XRD}}{2} \right)^2$$

$$\text{particle volume} = \frac{4}{3}\pi \left( \frac{d_{XRD}}{2} \right)^3$$

$$\text{Pd mol per particle} = \frac{\text{particle volume}}{\text{Pd atomic volume}} * N_{avog}$$

$$\text{mass of NP} = \text{pd moles per particle} * \text{Pd atomic mass}$$

$$Pd\ NPs\ per\ mass\ of\ material = \frac{mass\ of\ the\ material}{mass\ of\ NP}$$

$$Pd\ mol\ exposed\ per\ NP = \frac{particle\ surface}{Pd\ atom\ surface} * N_{avog}$$

$$Pd\ mol\ exposed\ per\ mass\ of\ material = \frac{particle\ surface}{Pd\ atom\ surface} N_{avog} * \frac{mass\ of\ the\ material}{mass\ of\ the\ particle}$$

### Calculations of TONs and TOFs

$$TONs = \frac{mol\ of\ Gasses}{mol\ of\ Pd\ exposed} = \frac{V_{gasses}}{(aH_2+aCO_2)} \quad (s1)$$

$$TOF = \frac{TONs}{t} \quad (s2)$$

Table S1. TONs and TOFs from catalytic results					
Pd <sup>0</sup> @SiO <sub>2</sub> -GA			Pd <sup>0</sup> -GA		
Temp.(°C)	TONs	TOFs(h <sup>-1</sup> )	Temp.(°C)	TONs	TOFs(h <sup>-1</sup> )
60	874	777	60	227	130
75	874	984	80	635	300
80	874	1499	90	663	349
90	874	2873			