

Supplementary information

1. N₂ adsorption-desorption data

Table 1 The characteristics of the Dried-SMP-R@SiO₂ and Calcined-SMP-R@SiO₂ catalysts after reduction

Catalyst	Specific surface area (m ² /g)	Pore volume (cm ³ /g)	Pore size distribution (nm)
Dried-SMP-R@SiO ₂	11.4	0.017	< 2.0 (micro); 20.7 (meso)
Calcined-SMP-R@SiO ₂	15.6	0.022	< 2.0 (micro); 17.2 (meso)

2. H₂-TPD and H₂-TPR characterizations

H₂-TPD experiments were carried out to estimate the surface metal exposure of the two catalysts. Before each measurement, the sample (0.3 g) was heated to 823 K in a flow of 25% H₂/Ar at a rate of 10 K/min, and kept at this temperature for 2 h. After being cooled down to room temperature (RT) and kept at RT for 0.5 h, the sample was purged with He at 323 K for 0.5 h. Then the catalyst was heated at a rate of 10 K/min while the H₂-TPD curve was recorded.

Temperature-programmed reduction (TPR) was conducted according to the following steps. Prior to each measurement, the sample (50 mg) was heated from room temperature (RT) to 623K at a rate of 10 K/min under Ar flow (40 ml/min), and kept at this temperature for 30 min for the removal of adsorbed specimen (e.g. H₂O). After the sample was cooled to RT, the gas flow was switched to 5% H₂/Ar (40 ml/min). Finally, TPR profiles were obtained with a temperature ramp of 10 K/min using a thermal conductivity detector.

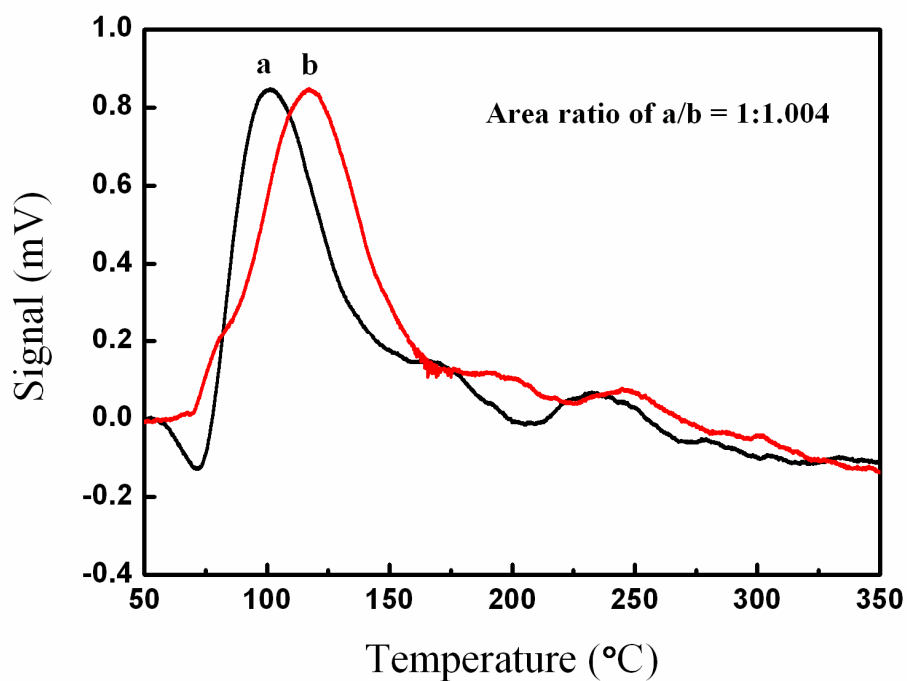


Fig. 1. H₂-TPD profile of (a) Dried-SMP-R@SiO₂ and (b) Calcined-SMP-R@SiO₂ catalysts. The area ratio of a/b is 1:1.004 in the temperature range of 50-350°C.

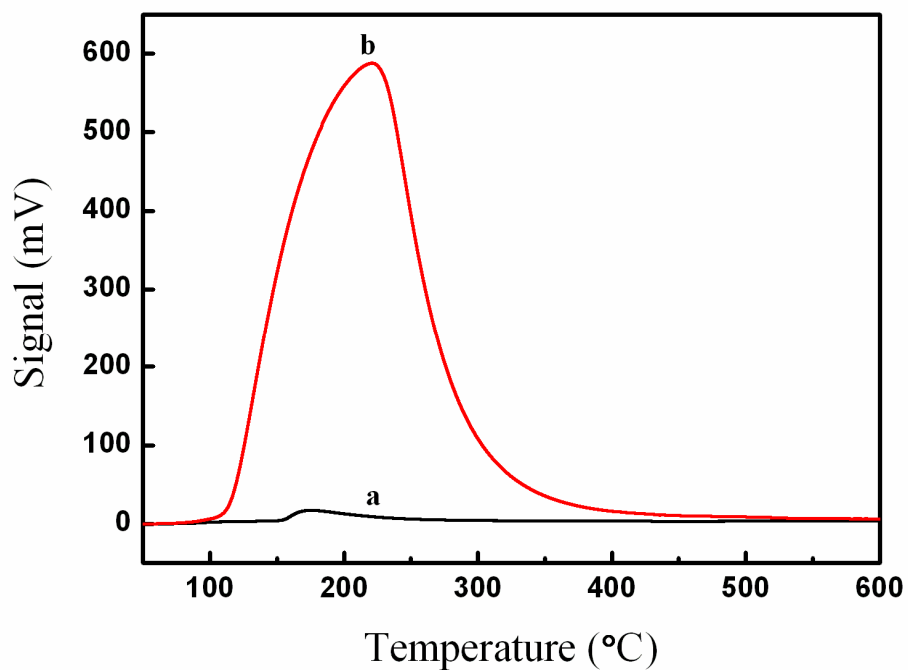


Fig. 2. H₂-TPR profile of (a) Dried-SMP@SiO₂ and (b) Calcined-SMP@SiO₂.