

Supplemental Materials

Promoting gold nanocatalysts in solvent-free selective aerobic oxidation of alcohols

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Experimental Section

To prepare oxide-supported gold nanoparticle catalysts, 6.3-nm dodecanethiol-capped gold nanoparticles were first prepared and then dissolved in chloroform to form a solution with a concentration of 100 mg Au / 100 mL chloroform. Oxide powders (e.g., TiO₂, SiO₂, ZnO) were then added to the gold solution and stirred for 3 hours before the solids were filtered. The amount of oxide powders added was calculated from the desired loading of gold. The solid was then dried at 80°C and calcined in air at 300°C for 1 hour to remove the organic capping agents. Once prepared, the catalysts were stored in closed glass containers.

The catalytic activity of all of the prepared catalysts in alcohol oxidations was evaluated by running the reactions in a 125-ml Parr batch stirred reactors. In a typical reaction, the reactor was first charged with desired amount of alcohol, catalyst and promoter (e.g., K₂CO₃, Na₂CO₃). After purging three times with oxygen and setting the oxygen pressure at 2 atm, the closed vessel was then heated rapidly to reach the desired reaction temperature while the stirrer was set at *c.a.* 1000 rpm. During the reaction, the oxygen pressure was maintained constant. After certain reaction time, normally five hours, the reactor was cooled to room temperature. The filtered liquid samples were quantitatively analyzed by ¹H NMR and gas chromatography. The catalysts before and after catalysis were assessed by transmission electronic microscopy (TEM) to evaluate the size and size-dispersion of gold nanoparticles.

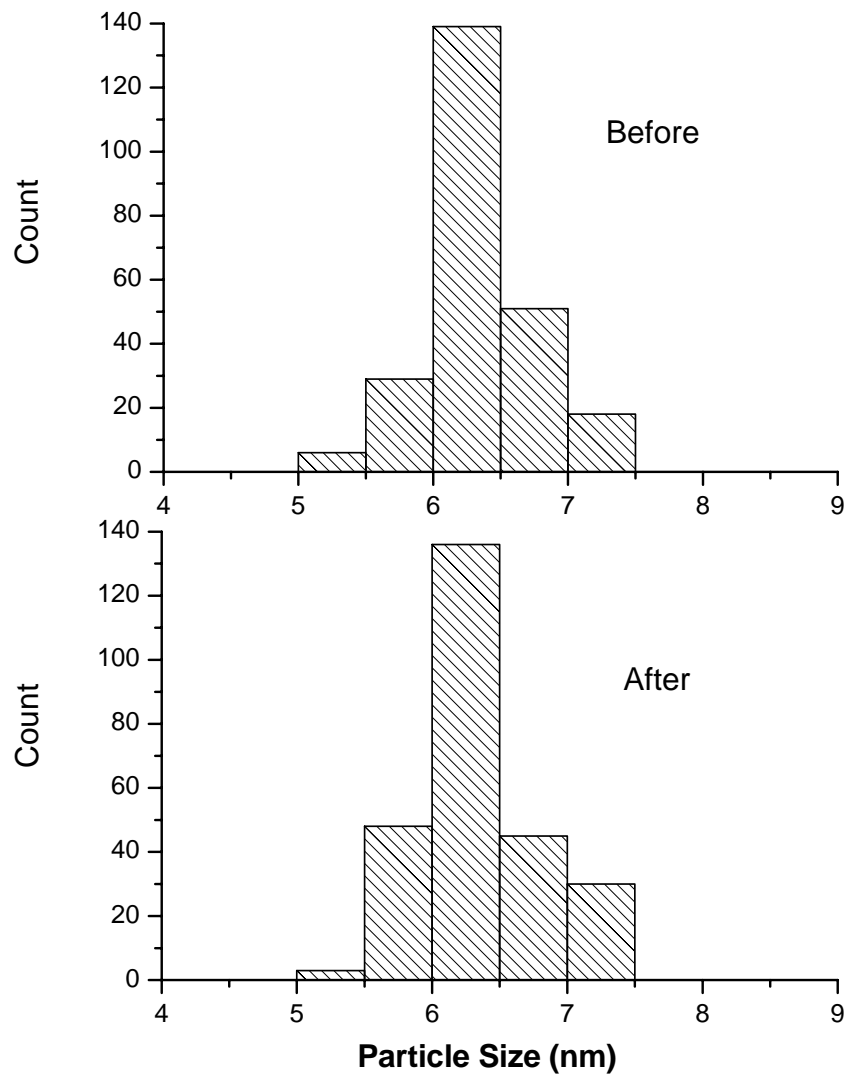


Figure S1. Size distribution of gold nanoparticles in the TiO₂ (P25 from Degussa) supported catalyst before (top) and after (bottom) aerobic oxidation of benzyl alcohol (Table 1, Entry 10). The catalyst was prepared by depositing gold nanoparticles (2.5% in weight) on TiO₂ from the chloroform solution of 6.3-nm dodecanethiol-capped gold nanoparticles followed by calcination at 300°C in air. The size of gold particles after the reaction is 6.4 ± 0.4 nm, not much different from the one before reaction (6.3 ± 0.4 nm).