

**Nano Congress 2018 & Nano Drug Delivery 2018: Thermally reduced gold nanoparticles confined by ordered mesoporous carbon as an efficient catalyst for selective hydrogenation - Ying Wan - Shanghai Normal University, China**

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Gold nanocatalysts represent a new generation of catalysts for the selective oxidation and reduction using molecular O<sub>2</sub> and H<sub>2</sub>, showing great potentials for green chemistry. Activated carbons are one of the most frequently used supports in industry. However, activated carbon has been seldom used for gold deposition. Here a coordination-assisted self-assembly approach is adopted for the intercalation of thermally reduced gold nanoparticles inside ordered mesoporous carbon frameworks. An almost complete conversion of benzyl alcohol to benzoic acid is achieved within 60 min over the Au/C catalyst with gold nanoparticles approximately 9.0 nm under 90°C and 1 MPa, using potassium hydroxide as a base. A reduction of gold particle size from 9.0 to 3.4 nm in the catalyst leads to a high activity toward the selective oxidation of benzyl alcohol to benzyl acid and toward the reduction of p-nitrophenol to p-aminophenol at low temperatures such as 0°C. The electronic modification of the d-orbitals of small particles is extremely important for chemisorption of O<sub>2</sub> at atmosphere pressure and low temperatures. Interestingly, thermally reduced Au/C nanocatalyst with

gold nanoparticles approximately 2.8 nm is highly active and selective to convert p-chloronitrobenzene and 4-nitrophenol to corresponding amines using H<sub>2</sub> as a reducing agent, reaching an initial reaction rate of 12.7 and 6.5 min<sup>-1</sup>, respectively. By comparison, the commercial Au/C catalyst is inert under the same reaction conditions. Trapping by the SH-functionalized SBA-15 solids confirms the negligible gold leaching and the heterogeneous active centers for thermally reduced Au/C. Obvious changes are undetected for catalytic performance after five runs. These results indicate that the gold-containing mesoporous carbon catalyst is stable and can be reused. The simultaneous thermal reduction of gold nanoparticles and pyrolysis of the matrix may facilitate the involvement of gold inside the carbon matrix, the modification of carbon atoms on the gold surface, and the reconstruction of the surface induced by CO adsorption. The generation of low-coordinated gold atoms possibly reduces the H<sub>2</sub> dissociation barrier, and can therefore significantly improve the hydrogenation activity.