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Heteroatom rich mesoporous carbon supported gold nanoparticles – An efficient catalyst for benzyl alcohol oxidation

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Oxygen and nitrogen rich hierarchically porous carbons (NC/O and NC/O,N respectively) were synthesized by using furfuryl alcohol and furfuryl amine respectively as the carbon precursors by nanocasting into hierarchically porous SiO_2 monolith templates. Gold nanoparticles (Au NPs) on porous carbon were synthesized by incipient wetness followed by reduction of chloroauric acid. The resulting supported catalysts were characterized by transmission electron microscopy (TEM), scanning electron microscopy (SEM), X-ray diffraction (XRD), X-ray photoelectron microscopy (XPS), Raman spectroscopy and N_2 sorption. The macroporous structure was successfully replicated in the carbon monoliths, while the mesopore structure was inverted giving high surface area and mesopore volume. From TEM the average nanoparticle size of the Au NPs was found to be 39 nm for NC/O and 25 nm on NC/O,N. SEM showed that the nanoparticles (NPs) were heterogeneously distributed on the carbon support. Au NPs were found to be metallic from the XRD patterns with metallic surface as indicated by XPS. Raman spectra indicated the presence of amorphous carbon and a new type of disorder could be seen in NC/O,N as revealed by the shift in D band frequency in NC/O,N. The Au NPs incorporated NC/O and NC/O,N are efficient catalysts for benzyl alcohol oxidation.

Keywords: heteroatom, carbon support, porous, gold nanoparticles, catalysis

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