Contribution (Poster)

Investigation of Alumina/Graphene Oxide role in catalysis

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Mesoporous alumina has long been utilized as a catalyst support in heterogeneous catalysis owing to its durability, tunability of its pore size distribution and ability to deposit precious metal nanoparticles into its pores(*1, 2*). However nanoparticle deposition is so far not ideal and there are continuing efforts to synthesize materials which can stabilize nanoparticles that lead to higher yields and selectivity. A second class of materials such as active carbon and carbon nanotubes have also been widely used due to their large surface area and outstanding electronic conductivity(*3-5*). However, these materials are usually impeded by their inaccessible pore structure. One material that has emerged over the past decade has been that of graphene oxide. Safe and environmentally friendly to synthesize, graphene oxide can be easily mixed with an alumina by a sol-gel method to produce tunable pore structures ideal for nanoparticle deposition. The presence of functional groups and defects on the graphene oxide sheets enhances the substrate nanoparticle interaction which can lead to a better dispersion uniformity and higher selectivity and yield(*6-8*). Moreover, the density and type of defect can be controlled by the chosen reduction method, thus allowing for finer control of the dispersion and size of the metal nanoparticles(*9-13*). Herein we report a new hybrid catalyst support which combines the optimal pore size features of mesoporous alumina with the desired ability of graphene oxide to anchor and stabilize precious metal nanoparticles for heterogeneous hydrogenation catalysis. Furthermore the particle size, shape and roughness of the novel catalyst support can be tailored by varying the starting material composition which enables control of the metal deposition and subsequential catalytic reaction.

References

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Figures

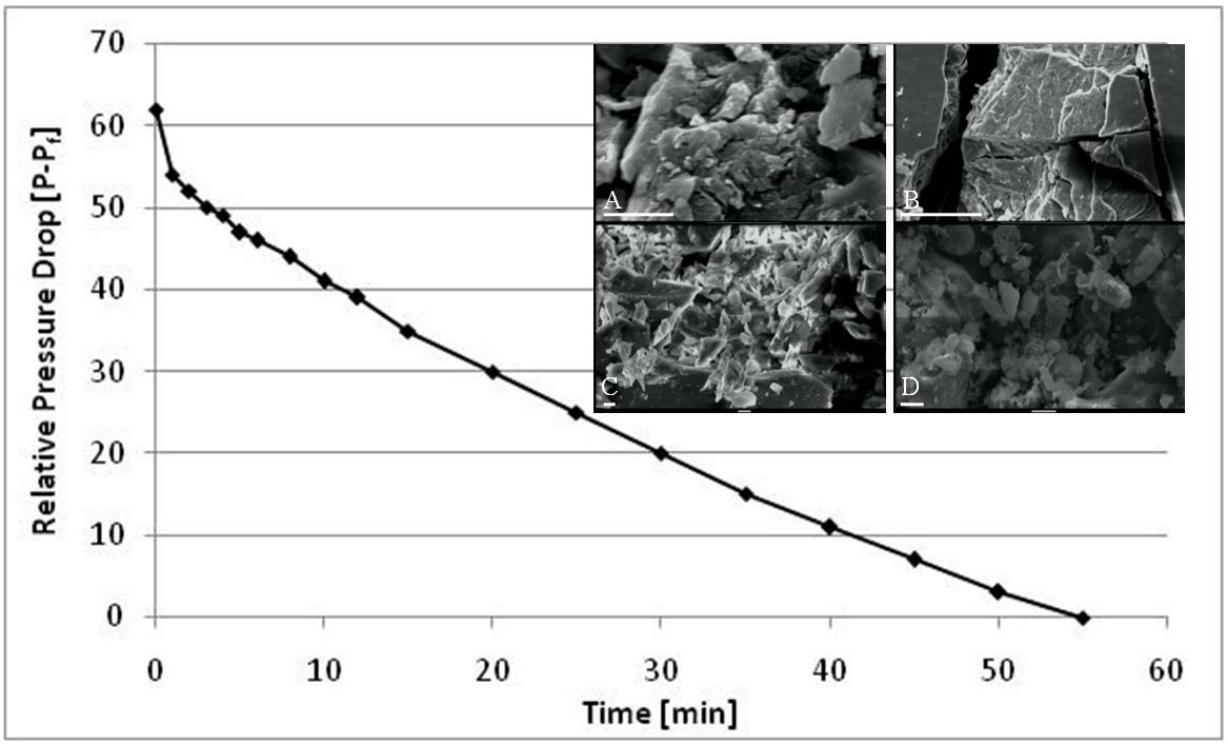

Figure caption: Hydrogenation of styrene in a pressure reactor with 0.5% wt loading of Pd nanoparticles deposited onto the graphene oxide/alumina hybrid catalyst support. The y-axis depicts the pressure drop relative to the final pressure. The inlet displays four SEM images of varying starting composition without Pd. A-C refers to a (wt/wt) ratio of graphene oxide solution to alumina powder of 2:1, 1:1 and 1:2 all with 1 M HCl. D refers to 1:2 mixture without acid. Scale bar in each is 10 µm.