Hydrogenation of Nanostructured Carbon

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Funding: National Science Foundation

The hydrogenation of nanostructured carbon is important for several application areas including lightweight, high strength composites containing well dispersed CNTs (carbon nanotubes), advanced materials for space radiation shielding, and hydrogen storage in fuel-cells. Using a highly efficient polyamine chemistry developed in our laboratory, we have now shown that fullerenes, single-walled carbon nanotubes, and nano-onions can all be hydrogenated under either thermal or microwave conditions. The use of a suitable catalyst is shown to increase the level of hydrogenation on fullerenes. Single-walled nanotubes (SWNTs) undergo hydrogenation with simultaneous opening of end-caps. Hydrogenation dramatically reduces bundling in SWNTs due to the partial elimination of pi-pi stacking between tubes. Applying our hydrogenation conditions to nano-onions, we observe that the top layers of the onions peel off exposing smaller nano-onions.