Hydrogen Storage in Engineered Carbon Nanomaterials

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Work at the University of Missouri (http://all-craft.missouri.edu), in an integrated material fabrication/characterization/computational effort, has demonstrated that surface-engineered graphene-like carbons which simultaneously host high surface areas and large fractions of surface sites with high binding energies for hydrogen, created by boron doping, offer a rich spectrum of materials for high-capacity reversible hydrogen storage by strong physisorption. The talk will give an overview of recent results, including: (i) demonstration that boron doping raises the H_2 binding energy from 5 kJ/mol on undoped carbon to 10-14 kJ/mol on the doped surface; (ii) demonstration of a 5.3-liter hydrogen sorption tank, packed with 1.5 kg of high-performance undoped carbon, with a storage capacity of 0.031 kg H_2/kg C (3.0 wt%) at 296 K and 100 bar; (iii) static loading of [H]/[Pd] = 0.81 at 303 K and 200 bar on a Pd sample from SKINR (Sidney Kimmel Institute for Nuclear Renaissance). The relevance of these results for the 2017 DOE targets for vehicular hydrogen storage, and for anomalous heat effects, will be discussed.