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Enhanced hydrogen affinity in single-walled carbon nanotubes relative to activated carbons M.K. HAAS, A.C. COOPER, C.G. COE, J.M. ZIELINSKI, G.P. PEZ — The present body of work represents a meticulous and thorough investigation of single-walled carbon nanotube properties and processing in relation to hydrogen storage. Nanotube samples were characterized by Raman spectroscopy, light scattering, microscopy, TGA, ICP, differential pressure adsorption (DPAU), and BET surface area. A reproducible carbon nanotube cutting method was developed and characterized. A number of nanotube variables, such as average length, were then evaluated for their effects on hydrogen capacity. Thorough characterization reveals the strongly variable nature of carbon nanotube materials. Diameter, length, purity, structural integrity, as well as secondary and tertiary morphology must be determined in order to establish any structure-property relationships. Measurements of hydrogen capacity indicate that commercially available single-walled carbon nanotubes in their pristine, non-functionalized form are not a viable hydrogen storage option. However, it is also clear that single-walled carbon nanotubes have a higher affinity for hydrogen than do activated carbons. At a given BET surface area, activated carbons have a fraction of the hydrogen capacity of single-walled carbon nanotubes. This information, in addition to Air Product's experimental modeling results, leads to a promising path forward. In particular, experiments with smaller diameter nanotubes and charge transfer intercalation are planned.

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