Abstract Submitted
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Record Hydrogen Storage Capacities in Advanced Carbon Storage Materials[1] C. WEXLER, M. BECKNER, J. ROMANOS, J. BURRESS, M. KRAUS, R. OLSEN, E. DOHNKE, S. CARTER, G. CASTEEL, B. KUCHTA, L. FIRLEJ, E. LEIMKUEHLER, A. TEKEEI, G. SUPPES, P. PFEIFER, University of Missouri — Carbons can be engineered to achieve exceptional storage capacities: the ALL-CRAFT (www.all-craft.missouri.edu) nanoporous carbon achieves gravimetric excess adsorption of 0.073 kg H_2/kg C, gravimetric storage capacity of 0.106 kg H_2/kg C, and volumetric storage capacity of 0.040 kg H_2/l C (80 K, 100 bar). The nanopores generate high storage capacity by having: high surface area (2,600 m^2/g); high H_2-wall interaction; and multi-layer H_2 adsorption (cryogenic). We we show how the experimental characteristics of the ALL-CRAFT carbon correlate to the observed H_2 storage, with help from theoretical considerations and GCMC simulations. The ALL-CRAFT carbon is composed of a large variety of pore sizes which generates substantial heterogeneity. We explain most features observed by considering superpositions of low- and high-binding energy sites (9 kJ and 5 kJ/mol), corresponding to wide and narrow (< 1 nm) pores. We further explain: exceptional low-temperature storage (in excess of the usual Chahine's rule); and absence of an excess adsorption peak (for $0 < P < 100$ bar).

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