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Liquid-like hydrogen densities in engineered carbon nanospaces ELMAR DOHNKE, ANDREW GILLESPIE, PETER PFEIFER, University of Missouri, Columbia, MO — High surface area materials, such as those engineered from synthetic carbon compounds, have narrow pore sizes resulting in exceptionally high stored densities for hydrogen. Stored density is a measurement of the average hydrogen density within a pore. At supercritical temperatures and high pressures, these materials can achieve stored densities 20% higher than liquid hydrogen at 1 bar and 20 K. At 77 K and 200 bar, we have achieved stored densities of up to 85 g/L. We can show, depending on the pore structure, a maximum of gravimetric hydrogen excess adsorption at 100 bar and 296 K and binding energies of 8-10 kJ/mol. The occurrence of a maximum of gravimetric excess adsorption at relatively low pressures, indicating a high binding energy, is due to the overlapping adsorption potentials in narrow pores.

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