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Measurements of Increased Enthalpies of Adsorption for Boron-Doped Activated Carbons[1] ANDREW GILLESPIE, MATTHEW BECKNER, NAGARAJU CHADA, JOSEPH SCHAEPERKOETTER, Physics Dept. U. of Missouri, ANUPAM SINGH, MARK LEE, Chemistry Dept. U. of Missouri, CARLOS WEXLER, JACOB BURRESS, PETER PFEIFER, Physics Dept. U. of Missouri
— Boron-doping of activated carbons has been shown to increase the enthalpies of adsorption for hydrogen as compared to their respective undoped precursors (>10kJ/mol compared to ca. 5kJ/mol). This has brought significant interest to boron-doped carbons for their potential to improve hydrogen storage. Boron-doped activated carbons have been produced using a process involving the deposition of decaborane ($B_{10}H_{14}$) and high-temperature annealing resulting in boron contents up to 15%. In this talk, we will present a systematic study of the effect that boron content has on the samples' structure, hydrogen sorption, and surface chemistry. Measurements have shown a significant increase in the areal hydrogen excess adsorption and binding energy. Experimental enthalpies of adsorption will be presented for comparison to theoretical predictions. Additionally, samples have been characterized by thermal gravimetric analysis, gas chromatography-mass spectroscopy, Fourier transform infrared spectroscopy, and X-ray photoelectron spectroscopy. TGA and GC-MS results investigated the decomposition of the decaborane in the carbon. Boron-carbon bonds are shown in the FTIR and XPS spectra, indicating that boron has been incorporated into the carbon matrix.

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Jacob Burress
Physics Dept. U. of Missouri

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