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Hydrogen Adsorption in Carbon-Based Materials Studied by NMR YUE WU, ALFRED KLEINHAMMES, ROBERT ANDERSON, SHENGHUA MAO, University of North Carolina-Chapel Hill — Hydrogen adsorption in carbon-based materials such as boron-doped graphite and boron-doped single-walled carbon nanotubes (SWNTs) were investigated by nuclear magnetic resonance (NMR). ^{1}H NMR is shown to be a sensitive and quantitative probe for detecting adsorbed gas molecules such as H_2, methane, and ethane. NMR measurements were carried out in-situ under given H_2 pressure up to a pressure of over 100 atm. From such ^{1}H NMR measurement, the amount of adsorbed H_2 molecules was determined versus pressure. This gives an alternative method for measuring the adsorption isotherms where the H_2 signature is identified based on spin properties rather than weight or volume as in gravimetric and volumetric measurements. The measurement shows that boron doping has a favorable effect on increasing the adsorption enthalpy of H_2 in carbon-based systems. This work was done in collaboration with NREL and Department of Chemistry, University of Pennsylvania, within the DOE Center of Excellence on Carbon-based Hydrogen Storage Materials and is supported by DOE.

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