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Transport and Magnetism in Template Synthesized Hydrogenated Multiwalled Carbon Nanotubes ADAM FRIEDMAN, Northeastern University Department of Physics, HYUNKYUNG CHUN, Northeastern University Department of Mechanical and Industrial Engineering, DONALD HEIMAN, Northeastern University Department of Physics, YUNG JOON JUNG, Northeastern University Department of Mechanical and Industrial Engineering, LATIKA MENON, Northeastern University Department of Physics — In this work, we synthesize highly disordered carbon nanotubes by CVD in porous alumina templates. We show that, due to the disorder in the nanotubes, they can easily be made to uptake hydrogen by annealing. We show that this induces ferromagnetism in the nanotubes, and we perform a magnetic study. We also measure the transport properties of the nanotubes. First, we find a rate dependent hysteretic magnetoresistance. We explain the rate dependence through strong magneto-viscosity effects, and we attribute the hysteresis to anisotropic magnetoresistance. We also discover a magnetic field-driven temperature dependent transition from positive to negative magnetoresistance in the ferromagnetic nanotubes that is not observed in similarly disordered un-hydrogenated carbon nanotubes. We attempt to explain this behavior by considering it an order-disorder transition described by the Bright model due to several scattering pathways, that are present in the ferromagnetic nanotubes that are not present in the non-ferromagnetic tubes.

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