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Adsorption of Atomic Hydrogen on Singlewalled Carbon Nanotubes

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We have investigated adsorption and desorption of atomic hydrogen in singlewalled carbon nanotubes using ultraviolet photoelectron spectroscopy (UPS) and thermal desorption spectroscopy (TDS). We observe from UPS data that π states reduce with increasing hydrogen doses and a new peak is developed near 8.6 eV but is gradually diminished with time. The TDS data show three characteristic peaks at 640, 750, and 790 K. By comparing with density functional calculations, we propose these peaks to be related to the presence of atomic hydrogen, chemisorption of hydrogen atoms on the outer tube wall and inner walls, respectively. We note that the UPS data are fully recoverable after hydrogen desorption at 1200 K.