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Critical silicon dioxide thickness for CVD growth of single-walled carbon nanotubes J. M. SIMMONS, MATTHEW S. MARCUS, O. M. CASTELLINI, Department of Physics, University of Wisconsin - Madison, R. J. HAMERS, Department of Chemistry, University of Wisconsin - Madison, M. A. ERIKSSON, Department of Physics, University of Wisconsin - Madison — Chemical vapor deposition (CVD) has shown remarkable control over the efficient and directed assembly of single-walled carbon nanotubes, making CVD a primary growth method for device applications. Due to the high temperatures involved in CVD, the chemical compatibility between the substrate, feedstock, and catalyst must be understood. Using x-ray photoelectron spectroscopy (XPS), we have studied the evolution of the chemical state of an iron nitrate catalyst during the initial temperature ramp of a standard CVD process. Heating the catalyst on clean silicon or on silicon with a native oxide leads to the formation of a silicide at 800 ^{o}C, inhibiting single-walled nanotube growth. By 900 ^{o}C, a typical growth temperature, all of the iron catalyst has been incorporated into the silicide. Thicker silicon oxide layers, on the order of 10 nm, effectively prevent silicide formation, enabling high yield growth.

J. M. Simmons
Department of Physics - University of Wisconsin - Madison

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