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Adhesion measurement of carbon nanotube films deposited on silicon substrates[1] ANIRBAN SARKAR, THEDA DANIELS-RACE, Div. of Electrical and Computer Engineering in the School of Electrical Engineering and Computer Science, Louisiana State University, Baton Rouge — Electrophoretic deposition (EPD) has attracted substantial interest as a room temperature based economical and versatile processing technique. EPD has been used in the fabrication of thin and thick films of carbon nanotubes (CNTs) on conducting substrates. However, in this work, to the best of our knowledge, for the first time EPD of CNTs on semiconducting substrates—both bare and coated (Si/SiO_2, Si/Si_3N_4) silicon — has been investigated in detail. The process resulted in CNT film thicknesses of up to $\sim$15 μm from aqueous suspensions at low deposition voltages (5-30 V). A thin layer of metal film ($\sim$300 nm of aluminum), thermally evaporated on the samples, promotes adhesion between the CNTs in the EPD suspension and the intended target surfaces. In this study, post-EPD measurements have been investigated to assess the adhesion strength of the fabricated films. The qualitative measurements include the Peel Test (as per the American Society for Testing and Materials (ASTM) D-3359-97 standard) and ultrasonication tests. Direct pull off and nitrogen gas impingement tests have been developed for quantitative estimation. Experimental results indicate interfacial adhesion strength greater than 0.5-1 MPa between the fabricated films and substrates. Values reported are indicative of the applicability of electrophoretically fabricated CNT films for silicon based micro-electronics and MEMS development.

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