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Electron Yield Measurements of Vertically Aligned Multi-Walled Carbon Nanotubes BRIAN WOOD, JR DENNISON, JUSTIN CHRISTENSEN, GREG WILSON, Utah State University, MATERIAL PHYSICS GROUP TEAM
— Surface modification of materials—including roughness, modulation, and contamination—can act to decrease the electron yield (EY). Many applications require very low EY materials to eliminate unwanted emission in critical processes. Vertically grown carbon nanotubes (CNT) are an ideal candidate for low EY, due to their surface morphology, high aspect ratio, and carbon's propensity to absorb radiation. Using a chemical vapor deposition method, a CNT forest sample of height ˜40 m was grown on a silicon substrate capped with a 3 nm thick Al diffusion barrier. Data of total, secondary, and backscatter EY were taken for energies between 20-5000 eV, allowing a comprehensive characterization of the nanotube's response to electron bombardment normal to the sample, both in low and high energy ranges. Spectra of the emission flux as a function of emission energy were also acquired, detailing the emission profile and giving insight into possible charging effects. Preliminary results of this study include the CNT's effect of reducing the yield due to its inherent absorbing capabilities, along with any possible contribution from the substrate. Comparing yields of vertically grown CNT to yields of bulk and microcrystalline graphite, graphitic amorphous carbon, and unaligned CNT provides a quantitative estimate of the specific nanostructure contribution to the CNT yields. These results can be extended to similar geometries in other structured materials.

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