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Numerical and experimental studies of enhanced electron emission from functionalized carbon nanotube emitters FENG JIN, SCOTT LITTLE, FERAS ALZUBI, Ball State University — Vertically aligned carbon nanotubes (CNTs) were grown using plasma enhanced chemical vapor deposition (PECVD) method. The CNTs were further functionalized by coating their surface with a thin layer of low work function oxide emissive materials. The electron emission capability of the coated CNT emitters was greatly improved with the low work function emissive layer, particularly at high temperature. Thermionic emission current three orders magnitude higher was observed. The emission properties of the oxide coated CNTs were measured and characterized over a wide temperature and field ranges. It was found that neither the Fowler-Nordheim theory for field emission nor the Richardson theory for thermionic emission were adequate to describe the electron emission characteristics of these emitters in certain range of temperature and field. However, by adopting a general electron emission formulism developed by Murphy and Good, we were able to simulate the electron emission from the coated CNTs over the whole temperature and field range and fit the experimental data.

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