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Electron Field Emission from Nanostructured Carbon Materials SANJU GUPTA, Southwest Missouri State University — Fabricating small structures has almost become fashionable and the rationale is that reducing one or more dimensions below some critical length changes the systems' physical properties drastically, where nanocrystalline diamond (n-D) and carbon nanotubes (CNTs) in the class of advanced carbon materials serve model examples. Emission of electrons at room temperature - cold electron emitters - are of vital importance for a variety of vacuum microelectronic devices - electron microscopes, photo multipliers, X-ray generators, lamps, and flat panel displays and microwave cathodes. Electron emitters may lead to otherwise difficult to obtain advantages in performance and/or design. This is the driving force to investigate the carbon-related materials as cold cathodes. In this talk, the performance of various forms of carbon in thin film form including diamond, n-D, and vertically aligned CNTs as cold cathodes for their potential use in field emission displays (FEDs) in terms of I - V characteristics and corresponding spatial imaging will be presented. Physics based models such as, NEA, surface modification, geometric enhancement, and microstructure alteration due to particle bombardment, and doping, will be described to support the experimental observations of electron field enhancement (low turn-on voltage, high current and emission site density) and its reliability from the abovementioned carbon-related materials. Other vacuum device applications such as thermionic power generators will be mentioned briefly.

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