Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Understanding the emission current limiting step in the carbon nanotube based polymer composite cathodes DAVID CAREY, THOMAS CONNOLLY, RICHARD SMITH, University of Surrey — Carbon nanotube (CNT) based electronic applications often make use of the intrinsically high electrical conductivity of the nanotubes for charge transport. One attractive area for the exploitation of nanotubes is to combine their high electrical conductivity with their high aspect ratio leading to the development CNT based cathodes. In the presence of an electric field the field lines concentrate on the tip of nanotube and the resultant high local electric field (few V/nm) can result in electron tunneling (Fowler – Nordheim tunneling) from the tip and emission. Embedding a nanotube in a polymer matrix opens up the possibility of a large area and a solution processable way to produce cathodes [1]. We have studied the factors that control the rate limiting step for electron transport in functionalized CNTs in polyvinyl alcohol composites. We demonstrate excellent emission and current transport for nanotube volume fractions down to as low as 1 vol.% and that in the range from 1 vol.% to 7 vol.% the threshold field for emission does not significantly depend on nanotube content. Key to good emission is the ability to disperse the nanotubes efficiently.

[1] T. Connolly, R. C. Smith, Y. Hernandez, Y. Gun'ko, J. N. Coleman and J. D. Carey, Small **5**, 826 (2009).

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Date submitted: 16 Dec 2010 Electronic form version 1.4