

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Field Emission from Carbon Nanotubes: From Isolated Nanotubes to Matrix Cathodes. DAVID CAREY, RICHARD SMITH, RAVI SILVA, University of Surrey — The high aspect ratio and current carrying ability of carbon nanotubes (CNTs) make them an attractive material for electron sources. Field screening effects are known to occur at high nanotube densities and most large area field emission characteristics (FECs) reflect ensemble averages of the sites with the lowest effective potential barriers. We have studied the FECs and enhancement factor from isolated nanotubes mounted on high resolution manipulators within a scanning electron microscope. We have further developed an in-situ three terminal characterisation facility allowing estimates of the screening factor of the gate electrode and gate transparency. Measurements of the FEC of carbon nanotube – polymer spin cast composites cathodes have also been made. A range of samples with arc discharge nanotube mass fractions up to 7 % was prepared. Electron emission at low applied electric fields is observed. The transport and emission mechanism of the electrons is discussed in terms of a polymer coating that surrounds the nanotube and acts as a tunnel barrier. This gives rise to fluctuation induced tunnelling between the nanotubes which affects the field emission. The effects of the disordered percolation control network on the field emission along with prospects for applications are discussed.

David Carey
University of Surrey

Date submitted: 16 Jan 2006

Electronic form version 1.4