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# The effect of electrical annealing for the uniform emission pattern from double-walled carbon nanotube emitters

T. J. Lee, S. C. Lyu, S. K. Choi, D. S. So, and C. J. Lee  
Department of Nanotechnology, Hanyang University

The effect of electrical annealing for the uniform emission pattern and field emission properties from double-walled carbon nanotube emitters fabricated on the Ti deposited silicon substrate by spray method was investigated. In this work, the turn on electric field was about 1.7 V/ $\mu\text{m}$  and the current density was about 18 mA/ $\text{cm}^2$  at the applied electric field of 8 V/ $\mu\text{m}$ . The lifetime indicated good stability during 20 hours constant voltage apply. We also achieved uniform emission pattern using DWNT cathod arrays on a large area Ti/Si substrate (4x8  $\text{cm}^2$ ) and green phosphor coated ITO glass anode. The Emission pattern, at the first time, had a small number of hot spots. But it was changed to the uniform pattern after 24 hours electrical annealing. when the hard electrical annealing conditions introduced, the carbon nanotube emitters and the phosphor anode were damaged.