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Field Enhanced Thermionic Emission from a New Cathode Using Oxide Coated Carbon Nanotubes FENG JIN, CHRIS DAY, Ball State University — We report field enhanced thermionic emission from a new type of cathode based on oxide coated carbon nanotubes. This cathode consists of a metal substrate with carbon nanotubes grown on its surface using plasma enhanced chemical vapor deposition. The carbon nanotubes are further coated with thermionic emission materials (BaO, SrO, and CaO). These oxides are coated by magnetron sputter deposition and spin coating techniques. The emission current density from this cathode is at least an order of magnitude higher than from a conventional thermionic cathode coated with the same emission materials operated at the same temperature. This strong emission current is attributed to the field enhancement effect. Field enhancement is usually negligible for conventional thermionic cathodes; however, in this case the high aspect ratio of carbon nanotubes induces significant field enhanced thermionic emission. We present comparisons of some early experimental results for three different cathodes: 1) a oxide coated carbon nanotube cathode, 2) a conventional oxide cathode, and 3) an uncoated carbon nanotube cathode.

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