

Study of nanometrically thin pyrolytic carbon films for explosive electron emission cathode in high-voltage planar diode

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We report high current density explosive electron emission from a copper cathode with diameter of 50 mm with pre-deposited pyrolytic carbon (PyC) films being from 70 to 150 nm thick. In the diode configuration, we demonstrate the current density as high as 300A/cm² under applied voltage below 400 kV. The Raman measurements reveal that the PyC film survives after 7 shots. In order to study the cathode degradation we compared optical microscope images of the cathode before and after shots. We observed that the pre-deposited PyC film cathode prevents copper evaporation and oxidation. This property ensures a higher explosion emission stability and longer lifetime of the PyC/Cu-cathodes in comparison with conventional graphitic/Cu ones. Our results show that PyC/Cu cathodes are most promising for applications that require electric field strengths from 50 to 60 kV/cm.