Stability of Field Emission Characteristics of Nanostructured Amorphous Diamond Deposited on Indium-Tin Oxide Glass Substrates

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Amorphous diamond with a nanostructure was coated on an ITO glass substrate by spraying with a cathodic arc. The ITO substrate was cooled at a temperature of less than 150°C during the coating process. The stability of electron emission for this amorphous diamond coating was monitored at 480 V for 5 h. The average emission current decreased by ~5% after 5 hours of operation at the current level of ~0.8 mA/cm². The current fluctuation during the entire period was ±7%. This fluctuation may be due to the absorption and desorption of gas molecules on the surface of the nanostructured amorphous diamond. The sample was stored for 6 months in a humidity-controlled chamber that was maintained at a temperature of 25–30°C and relative humidity of 40–50%. Subsequently, it was annealed at 300°C in vacuum for 1 h. The emission performance of this aged sample appeared to remain unchanged. It appears that the bonding structure of the amorphous diamond film remained intact, as the Raman spectra were the same as the initial ones. The stability of field emission observed in this research implies that the amorphous-diamond-coated ITO can be an effective material for application in front-panel displays.

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