

EMISSION PROPERTIES OF STRUCTURED CARBON FILMS

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S u m m a r y

Experimental studies of the photoluminescence (PL) and the electron field emission (EFE) of structured carbon films fabricated by electron beam deposition of graphite have been performed. Carbon films were deposited onto the Fe, Fe+Ti, and Si substrates. In the latter case, the Fe catalyst was deposited onto the substrate by electrochemical deposition with the following low-temperature annealing. The key technological parameter for all experiments was the substrate temperature. For additional film characterization, scanning electron microscopy (SEM) and Raman scattering (RS) techniques were used. Intense PL has been observed for films deposited at low temperatures onto Fe and Fe+Ti substrates. The growth of the deposition temperature was accompanied by a decrease of the PL intensity and a shift of the main PL peak toward short wavelengths. The effective electron field emission has been observed from structured carbon films deposited onto a Si substrate with a catalyst. A sharp growth of the emission current and a decrease of the threshold electric field were revealed in the case of structured carbon films deposited at temperatures $T \geq 400$ °C. The following low-temperature annealing in the air environment resulted in a considerable improvement of the EFE parameters. To explain the experimental results obtained, we have proposed a physical model which takes into account the appearance of a band gap in the case of carbon micro- and nanostructures.