

# Fabrication of Field Emitters of Ultra-Nano-Crystalline and Micro-Crystalline Diamond Films by the MPECVD Method

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**Abstract.** Synthesis of ultra-nano-crystalline and micro-crystalline composite diamond (UNCD/MCD) films and lateral emitters comprising UNCD/MCD were grown by using microwave plasma-enhanced chemical vapor deposition (MPECVD). The field emission properties of UNCD/MCD films and lateral emitter devices made by UNCD/MCD were investigated. The results showed the best field emission characteristics for the film using 1200 W and 130 torr to grow UNCD, and using 1200 W and 80 torr to grow MCD, respectively. The optimal parameters were chosen to fabricate the UNCD/MCD lateral emitter. Easy and convenient process was obtained to fabricate the lateral emitter device with the initial electric field of  $46 \text{ V} \cdot \mu\text{m}^{-1}$  and the maximum achieved current  $39.5 \mu\text{A}$  ( $208.4 \text{ mA} \cdot \text{cm}^{-2}$ ).