

Abstract Submitted
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Plasma-Enhanced Deposition of Nanocrystalline Diamond/Carbon Nanowall Composite Films for Field Emitters K. TEII, Y. KANEKO, K. TERADA, Kyushu University, A.T.H. CHUANG, University of Cambridge — Two methods of substrate scratching pretreatment using diamond powder are employed to fabricate nanocrystalline diamond/carbon nanowall (CNW) composite films [1]. The surface after scraping for undulation has continuous undulant scratches with a number of residual diamond grains exclusively along the scratches, while that after scratching with ultrasonic vibration shows irregular distributions of residual diamond grains and scratches, depending upon the size of the powder. Nanocrystalline diamond film/CNW composites are obtained with either pretreatment method by moderate-pressure microwave plasma-enhanced chemical vapor deposition using an Ar/N₂/CH₄ mixture. With increasing the duration of scratching, the morphology of the deposits changes from CNWs to a film/CNW composite and lastly to CNWs on a film, accompanied by an overall increase in wall spacing. The turn-on field for field emission decreases from 2.1 V/ μ m without scratching down to 1.2 V/ μ m with scratching due to suppression of electric field screening between the walls as evidenced by the larger field enhancement factor.

[1] C.Y. Cheng, M. Nakashima, K. Teii, *Diamond Relat. Mater.* **27-28**, 40-44 (2012).

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