Study of Doped Diamond Layers by X-ray Diffraction

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Abstract. Boron-doped diamond (BDD) layers grown by large-area microwave chemical vapour deposition were investigated to clarify how gas chemistry and substrate temperature jointly tailor their structural properties. Two series of mixture were compared: H_2/TMB/CH_4 with varying B/C ratios, and H_2/TMB/CH_4/CO_2 mixtures at different substrate temperatures. X-ray diffraction in GIXRD geometry were employed to determine the lattice parameter of the diamond films, revealing a clear dependence on both boron concentration and deposition temperature. Raman spectroscopy was used to assess the quality and supporting the structural findings. Additionally, growth rate data as a function of substrate temperature were evaluated to better understand the effects of CO_2 addition and temperature on film formation. The results demonstrate a strong correlation between process parameters, structural properties, and growth kinetics, contributing to the optimization of boron-doped diamond film synthesis.