



# Impact of annealing process on stacking orientations and second order nonlinear optical properties of metallophthalocyanine thin films and nanostructures

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## Résumé en anglais

Abstract The paper presents the second order nonlinear optical properties of Cu, Co, Mg and Zn metallophthalocyanines thin films. The films were fabricated by physical vapor deposition in high vacuum onto fused silica glass substrates. In order to investigate both optical and structural properties an annealing process in an ambient atmosphere for 12 h at temperatures equal to either 150 °C or 250 °C applied after the fabrication process. Atomic force microscopy images were obtained for an observation of the structural property changes. The thickness of the thin films was in the range from 80 nm to 120 nm. The size and shape of the forming nanostructures were different for different metallophthalocyanines and depended on the phase of the material. As-deposited sample of copper phthalocyanine formed the smallest nanostructures - standing columns with 100 nm of the height and 40 nm of the diameter. Annealed sample formed the largest nanostructures - lying cuboids with dimensions: 10 × 1000 × 40 nm. The second harmonic generation measurements have been carried out in order to investigate the second order nonlinear optical properties and their dependence on the structure of the thin films after the annealing process. Moreover the fittings based on the two models have been carried out in order to understand deeper the origin of the experimental findings. It was found that the annealing process can significantly modify both the structural and the second order nonlinear optical properties of the metallophthalocyanine thin films.

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