

## Structural and Morphological Properties of 3,4,9,10-PeryleneTetraCarboxylic DiAnhydride Films on Passivated GaAs(100) Substrates

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### Abstract

Raman spectroscopy is employed to investigate *in situ* the structural properties and the morphology of 3,4,9,10-Perylene-TetraCarboxylic DiAnhydride (PTCDA) films deposited onto S-GaAs(100) substrates at various temperatures. Additional two-dimensional Raman mapping measurements are carried out *ex situ* to extract information at the microscopic level. Complementary atomic force microscopy studies reveal that all the films consist of islands. The crystalline nature of these islands is proven by the observation of libronic phonon-like modes in the Raman spectra characteristic to the molecular crystal. The decrease in the phonon band widths observed at elevated substrate temperatures is related to an increase in the size of the crystalline domains and improvement of crystallinity. The PTCDA films consist of a mixture of two polymorphs  $\alpha$  and  $\beta$  having the same symmetry and very similar lattice parameters. An estimation of the  $\alpha$ - to  $\beta$ - content at microscopic level is obtained from the deconvolution of an internal Raman mode with C-H deformation character following a previously introduced model.

**Keywords:** Raman Spectroscopy; Atomic force microscopy; Organic semiconductors based on conjugated molecules (not polymers) (anthracenes; perylenes, etc); Evaporation and sublimation; Other heterostructures (organic/inorganic heterostructure); Polycrystalline thin films

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