

Seminář odd. 26

Tenkých vrstev a nanostruktur

Fyzikální ústav AVČR, Cukrovarnická 10, Praha 6

datum: 27. 5. 2016 pátek

čas: 10:00

mítnost: knihovna, budova A, 1.p.

TÉMA

Application of Photothermal Expansion for Optical Absorption Mapping of nanostructured semiconductor materials

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In this work we demonstrate that photothermal expansion can be used to obtain images of nanostructured semiconductor materials such as GaSe flakes on graphite and carbon nanotubes on SiO₂ in ambient conditions with high sensitivity and spatial resolution. The principle behind is the detection of the mechanical force exerted on an atomic force microscopy (AFM) tip by the thermal expansion of the materials excited with pulses of optical radiation, taking advantage of the different absorption properties between substrate and sample. Characterization of semiconductor nanostructures, with a bandgap in the optical range enables the use of cw lasers chopped and synchronized with the resonance frequency of custom-made fully metallic cantilever AFM Au tips. The spatial resolution achieved by the synchronization procedure described is indeed in the nanometer range below 60 nm, and by taking advantage of the difference between optical absorption and thermal coefficients material contrast can be achieved.

odborný garant: *Hector Vazquez, Ph.D.*