

Seminar Fakulteta za fiziku

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Journey of single layer MoS₂: from synthesis to optical characterization and defect investigation

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Abstract

MoS₂ is one of the most investigated semiconducting two-dimensional (2D) materials due to its promising application in the semiconducting industry. One of the main issues is the controllable and reproducible synthesis of the high-quality MoS₂ samples with good and stable optical and structural properties. Here I will present my results regarding systematic synthesis of monolayer MoS₂ samples using chemical vapor deposition (CVD) technique followed up by the optical and structural characterization. The presentation is divided in two parts, where in the first part I will discuss how different synthesis parameters on morphology and optical properties of MoS₂ samples. In the second part, I will present the results of a detailed study on five different MoS₂ monolayers, synthesized under different growth temperatures, in order to understand the correlation between growth temperature and defects nature of the samples. Influence of defects on optical and electronic properties is investigated with low-temperature photoluminescence measurements [1] and room-temperature Kelvin Probe Force measurements [2], respectively. The study of defect influence on optical properties in 2D materials will be expanded to pump-probe measurements of mentioned MoS₂ samples, synthesis and characterization of various 2D alloys.

[1] V. Carozo et al. *Optical identification of sulfur vacancies: Bound excitons at the edges of monolayer tungsten disulfide*. Science Advances **3** 4 2017

[2] Y. Feng et al. *In situ visualization and detection of surface potential variation of mono and multilayer MoS₂ under different humidities using Kelvin probe force microscopy*. Nanotechnology **28** (2017) 295705