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Characterization of the ZrS₂ van der waals crystal using AFM and optical spectroscopy methods**Jaroslaw Serafinczuk, Magdalena Tamulewicz, Robert Kudrawiec and Teodor Gotszalk**

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ZrS₂ is a group IVB Transition Metal Dichalcogenides (TMD) material and one of the van der Waals crystals which can be exfoliated to a single monolayer. This 2D material has rarely been studied but can have superior electrical properties showing n-type transport behavior with an estimated mobility of $0.1^{-1}.1 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$. But most of these material parameters were calculated theoretically. In this paper, we want to present our technology which allowed us to obtain single ZrS₂ monolayer and results of the microscopic and optical characterization of obtained flakes. We used X-ray diffractometry for structure definition of the investigated ZrS₂ bulk crystals, AFM microscopy for measurement of the exfoliated flakes topography which allowed us to estimate the number of layers in the obtained flake and Kelvin Probe Force Microscopy (KPFM) for the work function of surface mapping. For 20 layer thick flakes the contact potential difference was about -0.20 V and it changes with the thickness of the sample. Optical spectroscopy methods defined ZrS₂ as a semiconductor with an indirect band gap of about 1.70 eV for bulk crystals.

Biography

Jaroslaw Serafinczuk has completed his PhD in 2006 from Wroclaw University of Science and Technology (WRUST). He is the Head of X-ray Diffraction Laboratory of Faculty of Microsystem Electronic and Photonics of WRUST. He has published more than 48 papers in reputed journals. His main topic of the research is connected to the X-ray diffractometry, structural study of materials, 2D materials and their characterization using microscopic methods.

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