Determination of refractive indices of layered GaSe by help of wavelength modulation spectroscopy

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Abstract. After obtaining graphene [1], the study of layered materials received a second breath. As with other layered 2D structures like graphene, adjacent GaSe layers are bound by the weak van der Waals force [2]. This makes it possible to peel the structure by mechanical or liquid exfoliation [3]. The resultant ultra-thin few or single layer 2D gallium selenide nanosheets or nanoparticles have well-known nonlinear optical properties and a range of applications in areas including integrated optics, optical information communications and biology [4]. Weak Van der Waals bonds of this material allow obtaining samples of various thicknesses. One of the fundamental optical constants of any material is the dialectical permittivity, and in particular its real part called the refractive index. One of the methods for obtaining this constant is its calculation from the interference fringes at a known sample thickness [5].

The wavelength modulation spectroscopy is a powerful instrument for recognizing of very weak signals [6]. In our case it was used a self-made equipment on the base of high aperture monocromator MDR-2. The samples

of different thicknesses were exfoliated by adhesive tape, and its thicknesses was measured by help of optical or SEM microscopes.

This paper examines the possibility of obtaining interference spectra by measuring wavelength-modulated transmission spectra to obtain a more contrasting interference fringes. It is shown that modulation spectroscopy can be used to more accurately determine the positions of the extrema of interference maxima and minima.

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