Optical Absorption Edge Shift in Rippled 2D InSe Flakes

A. Cuellar[1, *], G. Rubio-Bollinger[1, 2].

[1] Departamento de Física de la Materia Condensada, Universidad Autónoma de Madrid, 28049 Madrid.
[2] Condensed Matter Physics Centre (IFIMAC), Universidad Autónoma de Madrid, 28049, Madrid, Spain.
[*]alfonso.cuellar@uam.es

Abstract

Indium selenide (InSe) is a semiconductor that belongs to transition metal monochalcogenides (MX) 2D materials [1]. It is an interesting 2D material due to its optical, electronic, and technological applications e.g., solar energy conversion, laser, diodes, and infrared devices [1-2].
InSe is a direct-band-gap semiconductor in bulk (1.2 eV), but it turns into indirect band gap when its thickness is reduced to a few nanometers due to confinement effects [3]. Furthermore, the band gap of InSe flakes can be modulated by strain engineering technique.
In the present work, 2D InSe samples have been fabricated by mechanical exfoliation of bulk, and deposited on a flexible and transparent substrate, previously stressed by uniaxial force [1]. The optical absorption edge of rippled InSe flakes is measured by a scanning micro-transmittance technique. Results indicate an optical absorption band-edge shift up to ~0.3 eV between crest and valleys regions.

REFERENCES

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FIGURES

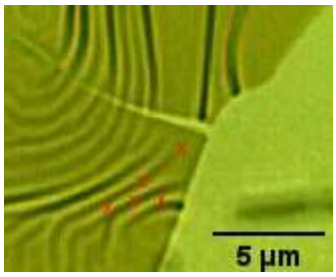

Figure 1: Transmission-mode optical microscope image of 7 layers of InSe wrinkled. The crosses indicate the region where spectra were registered.

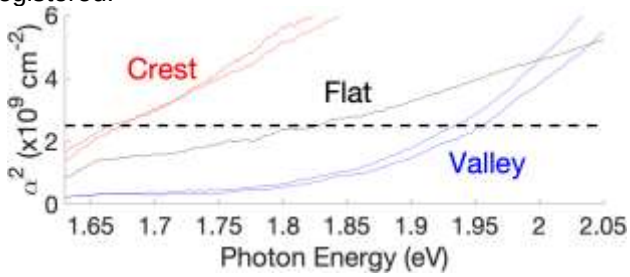

Figure 2: Optical absorption spectra at different crest (top), valley (bottom) and flat regions.