Investigations of hetero-structure of 2D materials and Graphene on copper by imaging Ellipsometry

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With the increase of investigations on 2D-materials new processing tools and creating new opportunities, e.g. by stacking up 2D-materials, rise up. For an efficient stacking of different materials the properties needs to be known. To characterize the optical properties imaging ellipsometry (IE) offers highest lateral ellipsometric resolution. Dispersion functions for Monolayer of Graphene and Molybdenum disulphide (MoS_2) for micron-sized exfoliated flakes are measured by IE [1, 2]. The imaging setup allows to measure different regions simultaneously. Figure 1 shows an ellipsometric contrast micrograph of the hetero-structure. The change in the state of polarization upon reflection is used to determine the optical answer of the investigated sample. By varying the wavelength n and k for the excitonic peaks of MoS_2 and WSe_2 for the regions in the figure are obtained. The effective medium approximation modelling for the overlapping area shows a broadened absorption that may be caused by intra-layer exciton. As [3] describes, an automated search for flakes of 2D-materials is depends less on the substrates than other conventional methods do, it offers high contrast for Graphene grown on copper-foil. In the talk maps of a millimetre sized foil will be shown. An evaluation of the ellipsometric angles Δ and Ψ, that denote the change in the polarization, will be given.
Investigations on hetero-structure and of Graphene on copper-foil highlight that IE is a powerful tool for non-destructive, lateral measurements of 2D-materials.

References

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Figures

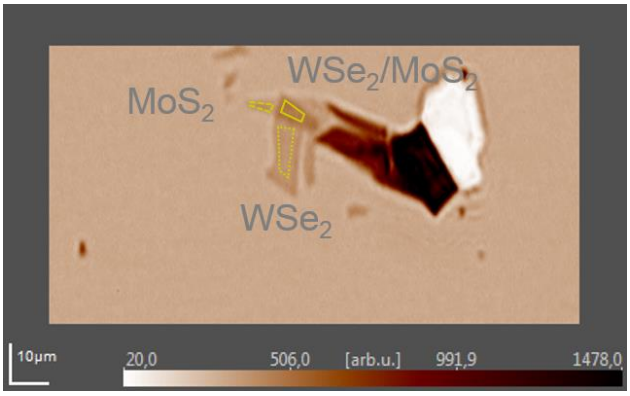

Figure 1: ellipsometric contrast micrograph Hetero-structure of MoS_2 and WSe_2 on SiO_2/Si substrate obtained by imaging ellipsometry