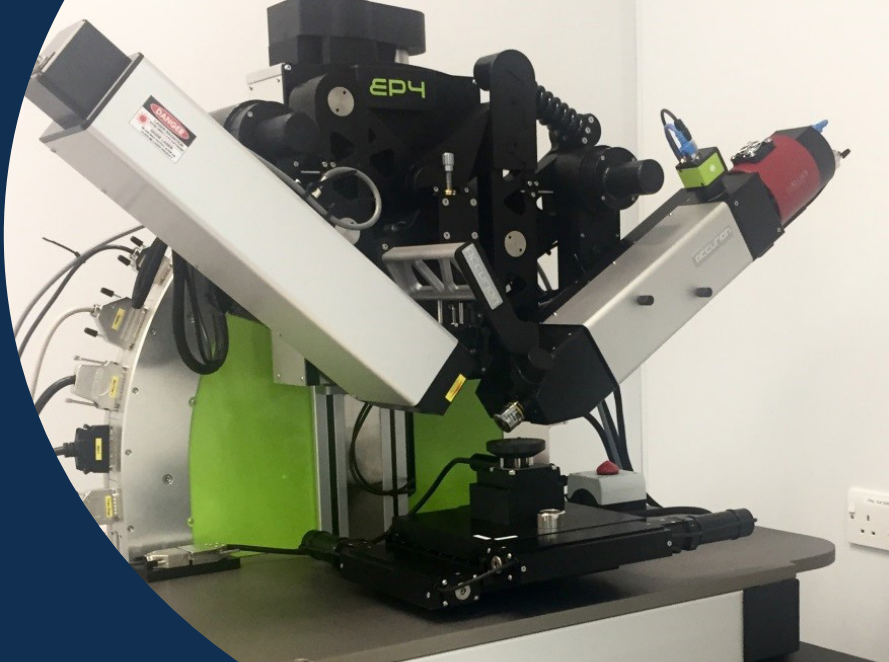# ELLIPSOMETRY CAPABILITY

Overview

Ellipsometry uses the interaction of the polarisation state of light with the substrate and a thin film (or a stack of films) and uses the change in the polarised light to extract characteristics of the thin film itself.

With ellipsometry, many properties of a variety of thin films and membranes can be inferred; these range from thickness to refractive index. From observing how these films interact with light and comparing it to literature value, you can deduce other qualities of the film such as stress, composition, density, roughness and quality of the overall film being investigated.

Being a non-destructive technique it can be used on the most precious of samples as well as those with layers to be developed further into devices with high level of reproducibility.

Thin films characterisation can prove problematic when looking at films under 5nm thick, but the sensitivity of ellipsometry gives the researcher capabilities to do so. Ellipsometry can also be used not only for single layer but multiple layer analysis, observing these parameters for all layers simultaneously.

Capability profile

System: Accurion Ellipsometer nanofilm EP4

Ellipsometers are suitable for investigating structures of nm-thin films. This ellipsometer is a reproducible way of assessing quality and thickness of a wide range of crystalline and amorphous thin films. This is very important when assessing in house-grown as well as bought-in substrates. It can be used on porous thin films as well as membranes to determine the quality of their composition.

It is also a valuable method of assessing large areas of exfoliated substrate to locate and determine quality of 2D materials such as graphene and h-BN which are in the focus of the work at Manchester.

ELLIPSOMETRY CAPABILITY

Depending on validity of models used, even more properties of the film can be deduced. Such properties include the density of the material, which in turn can be used to tune deposition/fabrication parameters as well as band-gap energies of the material. This can be used to help fundamentally understand the properties of flakes that are being investigated.

Wavelength 360nm-1700nm, 0.1nm increments

Null point ellipsometer/Lambda spectrum (spectroscopic ellipsomety)

AOI spectrum (angle of incidence spectrum)

Compensator:+/-45°, Polariser -range, Analyser-range; 1°-40°.

x10 magnification of sample

Automated x-y stage-mapping facilities up to 7cm in x and y with accuracy 0.001mm

Automated sample alignment

Multiple area of interests can be taken per image

Image capture at various wavelengths - image area, multiple images can be stitched together

Modelling capabilities including: Cauchy Cauchy_Urbach Sellmeier, Sellmeier_term n_k_fix, eps_fix Pole_UV, Pole_IR Gauss Lorentz Tauc_Lorentz, Tauc_Lorentz_Urbach, Cody_Lorentz Drude Forouhi_Bloomer, Fano Resonanz

Flake finder capable of finding flakes of pre-defined thickness

Thickness of sub 1nm can be modelled