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Developments in sample characterisation at the SXR endstation

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Many of the more demanding surface science experiments at the soft x-ray beamline are often concerned with the interaction between ordered substrates of novel materials and adlayer molecules or thin films. Whilst soft x-ray spectroscopy is extremely powerful in characterizing the chemical information at such interfaces, being able to measure concomitant changes in other physical properties can provide a more complete story; for example, understanding how we can control free charge carriers in novel materials using molecular acceptor or donor molecules. We detail two major hardware upgrades on the endstation for additional sample characterization. The first has been the addition of an Ultra high Vacuum (UHV) four point probe, capable of measuring the resistivity of samples in-situ. Under a continuous UHV environment, we can now obtain electronic structure and chemical information using soft x-ray spectroscopy, with changes in the electrical properties i.e basic transport measurements. The hardware is currently being extended to measure Hall Bar geometries with back gating. Recent results on DNA nucleobase molecules and their interaction with graphene are shown. The second major initiative has been the to develop robust means of measuring the sample workfunction, a property highly sensitive to surface chemistry. The photoemission-based method, using the secondary electron cutoff (SECO), has been initiated. For materials where the SECO method does not work (e.g insulators) we have installed a non-contact UHV Kelvin Probe. Recent results from the Kelvin probe and SECO on functionalised diamond surfaces are presented.

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work function, photoemission, Kelvin probe, surface science, graphene

Summary

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