

Inelastic scattering in the TEM: new applications and simulation methods



Speaker: Budhika Mendis

Department of Physics, Durham

Date: Tuesday 29th October at 13:00

Room: MAS2.06

The energy loss of relativistic electrons in a thin specimen gives information on the local chemical concentration, bonding environment as well as exciton, plasmon and phonon many-body excitations. Inelastic scattering is also important for correctly interpreting HREM and HAADF images.

In this talk I will discuss some recent work on inelastic scattering. The first, Compton scattering, provides information on the electron momentum density of states in solids. Previous measurements demonstrated feasibility of the technique but were limited by multiple scattering within the specimen. However, 2D materials such as graphene and TMDs are free of this problem, and provide a large class of important materials ideal for Compton scattering. New strategies to improve background subtraction and collection efficiency in Compton measurements will be discussed.

The second part of the talk will focus on incorporating plasmon energy losses in multislice simulations. Multislice is an elastic scattering calculation used to simulate HREM and HAADF images as well as diffraction patterns. An important limitation is that it does not include any energy loss, in particular plasmons which dominate the EELS energy loss spectrum. I will show how Monte Carlo techniques can be used to include plasmon losses in multislice. An interesting prediction is a plasmon 'de-channeling' mechanism which reduces the HAADF signal from atom columns and causes blurring of Kikuchi bands in diffraction patterns.