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Atomically-resolved scanning transmission electron microscopy characterization of material interfaces

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12.00 noon – 1.00 pm
Science Lecture Theatre S1, Building 25

Grain boundaries and interfaces of crystals have peculiar electronic structures, caused by the disorder in periodicity, which provide functional properties that cannot be observed in a perfect crystal. Dopants or impurities are often segregated in the vicinity of the grain boundaries and interfaces, and play a crucial role in the material properties. We call these dopants “function providing elements”, and they have the potential to change the macroscopic properties of the materials drastically. Results obtained by Cs (spherical aberration) corrected high-angle annular dark-field (HAADF) scanning transmission electron microscopy (STEM) will be shown for well-defined grain boundaries and interfaces in oxide materials. Light elements such as oxygen in the grain boundary structural units play a crucial role in the properties of these materials. Recently we have reported that annular bright-field (ABF) STEM imaging is a very powerful technique for producing images showing both light and heavy element columns simultaneously. It will be demonstrated that crystal structures and grain boundary atomic structures including light elements in oxides such as CeO_2, Al_2O_3 and lithium battery materials are directly observed by ABF STEM.

Convenors: Professor Joanne Etheridge, MCEM
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