MONASH University
Centre for Electron Microscopy

SEMINAR

Angle-resolved cathodoluminescence spectroscopy: a platform for nanoscale materials science and photonics

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16 Rainforest Walk

Abstract

Recently, electron-beam spectroscopy techniques have emerged as powerful probes in nanoscience due to their ability to generate, probe, and control light at length scales far below the diffraction limit of light. Taking advantage of the extremely high spatial resolution, novel techniques have appeared that combine electron beam excitation with optical spectroscopy. Spatially-resolved cathodoluminescence (CL) spectroscopy, in which the electron-beam-induced radiation is collected inside an electron microscope, is one of these techniques that holds great potential for nanoscience. For a long time CL spectroscopy was mainly used in geology to analyze and identify minerals, but in the past two decades its scope has expanded significantly. Recently it has been used to study fundamental optical properties of a myriad of metallic, semiconductor, and dielectric (nano)materials in the fields of materials science and nanophotonics, including plasmonics and metamaterials. We have developed a special version of CL spectroscopy in which we can both effectively measure the emitted spectrum as well as the angular emission distribution (SPARC). This seminar will discuss the different types of CL generation and how they are relevant to different fields of research. Subsequently, I will introduce the experimental setup and how angle-resolved CL is performed. To demonstrate the broad applicability I will show several experimental examples from the fields of nanophotonics, materials science, and geology.

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