Title: The Origins of Organic Matter and Amorphous Silicates in Meteorites – Clues from Nanoscale Investigations

Abstract:

Pristine carbonaceous chondrites provide important samples of the very early solar nebula. These complex rocks recorded snapshots of events 4.56 Ga years ago that can be disentangled by advanced analytical techniques on Earth. One of the most challenging components to analyse within such chondrites is the so-called “matrix”, a fine-grained mixture of presolar dust, amorphous and crystalline silicates, organic matter, sulphides, and metal, in which larger constituents such as chondrules or refractory inclusions are embedded. Organic matter (OM) and amorphous silicates within chondrite matrix are specifically important, because they record crucial condensation and synthesis processes in the solar nebula and meteorite parent bodies, but are also prone to alteration and destruction.

In this talk, I want to summarize recent work by high-spatial resolution analysis techniques (TEM, Ultra STEM, NanoSIMS) on amorphous silicates and organic matter in a variety of pristine carbonaceous chondrites. We analysed the functional chemistry signatures of these unique materials by electron energy loss spectroscopy (EELS) and synchrotron X-ray spectroscopy methods (STXM) to disentangle complex formation pathways. Organic matter records very early biomolecule reaction pathways, whereas the chemical composition and Fe oxidation state of amorphous silicates within matrix regions can be analysed to understand early solar nebula condensation and alteration processes.