MIXING AND VOLATILE DEPLETION IN THE EARLY SOLAR SYSTEM

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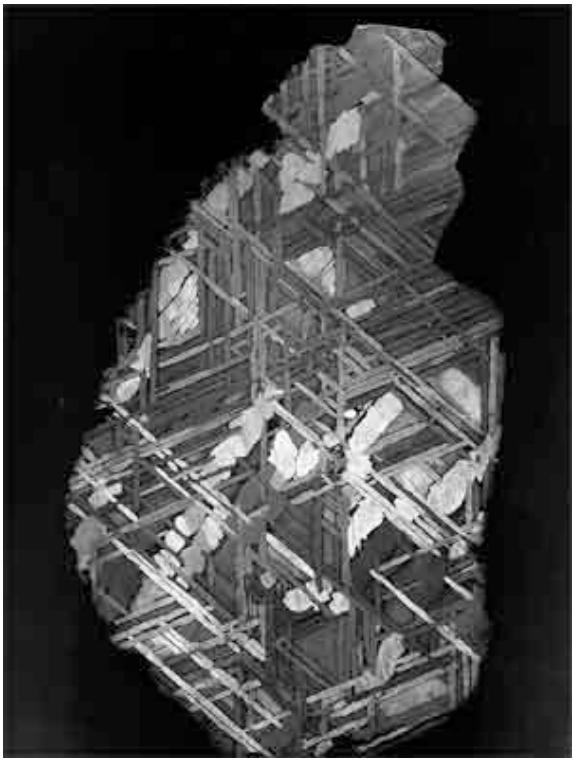
This research project addresses some of the most basic questions of planetary science – How well was the material of the solar system mixed when the first planetary bodies formed? Why are the Earth, Moon, Mars and most asteroids so depleted in volatile constituents? How and when did the Earth acquire its budget of volatile elements?

In the last years, new developments in modeling and analytical techniques have significantly improved our knowledge of early solar system processes but overall, our understanding still remains patchy. This project will utilize trace metal stable isotope analyses by MC-ICP-MS (multiple collector inductively coupled plasma mass spectrometry) to shed new light on these questions.

Depending on the exact interest of the candidate, the PhD research project will focus on individual or coupled analyses of copper, zinc, cadmium, molybdenum, platinum, lead and thallium isotope compositions of various meteorite types and meteorite constituents, such as CAI's and chondrules, as well as terrestrial samples.

The project is suitable for a student with a background in geology, chemistry, planetary science or equivalent experience. A significant component is analytical research in the *MAGIC Laboratories* (see www.imperial.ac.uk/ese/research/magic) of the Department. Further information about the project can be obtained directly from Mark Rehkamper at markrehk@imperial.ac.uk.



The picture shows a polished slab of an iron meteorite with the characteristic Widmanstätten patterns that form during the cooling of the metal.

Most iron meteorites are derived from the cores of asteroids that underwent melting and subsequent core segregation in the early solar system. The concentrations and isotope compositions of trace metals in such meteorites carry an invaluable record of mixing and volatile element depletion processes in the early solar system.

Selected Literature:

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Bridgestock, L.J., Williams, H., Rehkämper, M., Larner, F., Giscard, M.D., Hammond, S., Andreasen, R., Coles, B., Benedix, G.K., Wood, B.J., Theis, K.J., Schönbächler, M., Smith, C. Unlocking the zinc isotope systematics of iron meteorites. Earth Planet. Sci. Lett. 400, 153–164 (2014).

Wombacher, F., Rehkämper, M., Mezger, K., Bischoff, A. and Münker, C. Cadmium stable isotope cosmochemistry. Geochim. Cosmochim. Acta, 72, 646-667 (2008).

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