6.3.P07

FT-IR studies of planetary materials: Clues for chemical evolution of early solar systems

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Aim of the Study

Dust occurs in a variety of astrophysical environments – giant molecular clouds, accretion discs of young solar systems, supernova ejecta etc. Since these dust particles serve as the basic building block for most solid bodies in space (planets, asteroids, comets), an exact knowledge of the chemical composition of this primitive material is of great importance for the understanding of formation processes of our and other solar systems.

The aim of our project is to build a database of infrared and optical spectra of well characterized mineral separates and components from primitive meteorites. This data is intended to be used for comparison with astronomical data obtained from dust in space [1].

We plan to present data from our ongoing project which could allow to constrain the chemical composition of astronomical objects. An example are the shifting positions of bands in olivine (Fig.1), which occur as result of varying iron and magnesium contents [2,3].

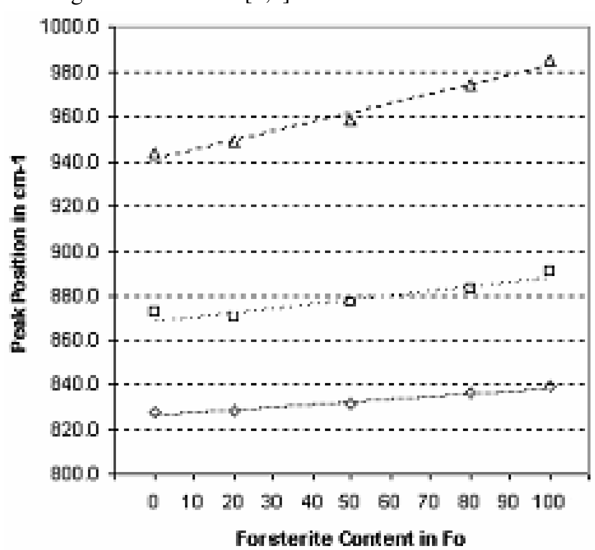

Fig.1: Trendlines of three bands in IR spectra of powdered olivines with varying Forsterite (Fo) composition. Diffuse Reflectance data.

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6.3.P08

From hard to soft matter using SR X-Ray Micro-Imaging

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The exact composition and morphology of minerals at the micron-scale has been a long-standing goal for the Earth Sciences community. The uniqueness of certain samples and the necessity of preserving them for subsequent analyses has imposed the restriction of non-destructivity for the probes employed. In particular cases, the need to analyze samples *in-situ* in a DAC *e.g.* while subjected to various extreme conditions such as P and T imposed a penetrating and highly-sensitive probe [1]. In other cases, the minute size of the sample as well as its vulnerability required a micro-probe [2]. Finally, for a large class of samples at the frontier of Earth, Environmental and Life Sciences, such as e.g. the purported biogenic alteration traces on Martian meteorites, or the terrestrial microorganisms subjected to extreme conditions of pressure and temperature [4] also related to extraterrestrial habitats, a number of probes and diagnostics had to be combined in order to obtain the necessary information. For all these cases, X-Ray spectroscopy, with its non-destructive, non-invasive, penetrating and highly sensitive character became a must. In the past 3 years we carried out pioneering studies in the development of X-Ray micro-imaging as a reliable, non-perturbing and quantitative method of analysis [5]. We managed to extend these studies to solving the 3D chemical structure of samples with micron resolution [6] and obtaining their speciation and morphology. Examples of these studies will be given as well as perspectives envisioned for the follow-up.

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