Mid-infrared spectroscopy of matrix materials from chondrites: first heating experiments

Conference or Workshop Item

MID-INFRARED SPECTROSCOPY OF MATRIX MATERIAL FROM CHONDRITES: FIRST HEATING EXPERIMENTS. A. Morlok[1,4], M. Koehler[2,4].and M. M. Grady[3,4] [1]The Natural History Museum, Cromwell Road, London, SW7 5BD, UK. E-mail: A.Morlok@nhm.ac.uk. [2]Institut fuer Planetologie, Wilhelm-Klemm-Str.10, 48149 Muenster, Germany [3]PSSRI, Open University, Walton Hall, Milton Keynes, MK7 6AA, UK [4]IARC

Introduction: Infrared spectroscopy is a way to compare laboratory data of planetary materials with those of astronomical observations. In our ongoing project [1] we systematically measure infrared spectra of minerals and components of meteorites, mainly for the comparison with spectra from dust material like circumstellar disks around young suns or comets. Here, we present first preliminary results of heating stage experiments with matrix materials separated from a variety of chondrites (Ornans CO3, Felix CO3, Allende CV3, Vigarano CV3, Ningqiang CK3, NWA978 CR, Kakangari K, Al Rais CR2, Cold Bokkeveld CM2 and Orgueil CI). While there are several infrared studies of bulk materials and matrices of meteorites [e.g. 2, 3], we provide additional information about the spectra of the materials at different temperatures. This gives insight into the change of such materials during heating processes e.g. in evolving, young solar systems.

Techniques: Matrix material was separated using a fine tungsten needle from polished blocks of meteorite sample under a binocular. It was tried to avoid larger mineral grains and other components. In the following, the materials have been ground to a sub-micron powder in a compression cell and placed on a KBr-disk in a LINKAM FTIR600 heating stage. This stage was mounted on a Perkin Elmer AutoImage FT-IR microscope. Spectra were taken in 100°C steps from room temperature to ~550 degree in transmission mode. The spectral range was from 2.5 to 16micron, limited by the ZnSe windows of the heating stage.

Results: The resulting preliminary spectra of the hydrated CI1 and CM2 meteorites are characterized by a single, big 'bulge'-like feature at ~9.9 micron, which is probably result of the dominating phyllosilicates.

The spectra of Ornans, Felix, Allende, Vigarano, Ningqiang and NWA978 are similar to olivine spectra at room temperature. Kakangari has characteristic spectra, with strong bands at 9.32, 9.89, 10.61 and 10.55 microns, probably a mixture of forsterite and enstatite features.

In the olivine dominated spectra the strong feature at ~11.3 micron hardly shifts with increasing temperature, while the smaller feature at ~10micron shifts towards higher wavelengths. Also the relative intensity changes, with increasing temperature the 11.3micron feature shrinks, while the feature at 10 micron grows relatively. The strong phyllosilicate features in the hydrated CI1 and CM2 chondrites shift from 9.9, 9.89 and 9.88 micron (for Cold Bokkeveld, Al Rais and Orgueil) to 10.32, 10.28 and 10.23 microns.

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References: [1] Morlok A. et al. 2005. *Submitted to Planetary and Space Science*. [2] Sandford S. A. 1984. *Icarus* 60, 115-126. [3] Osawa T. et al. 2005. *Meteoritics & Planetary Science, 40,* 71-86