Organic contamination during storage of carbonaceous chondrites for micro FTIR measurements

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We examined organic contamination by Fourier transform infrared micro spectroscopic (micro FTIR) measurements of carbonaceous chondrite samples. Carbonaceous chondrites, Tagish Lake (C2), Murchison (CM2) and Moss (CO3), and some mineral powder samples pressed on aluminum plates were measured by micro FTIR before and after storage in several containers with silicone rubber mat. During storage, samples did not touch directly anything except the holding aluminum plates.

The carbonaceous chondrites containing hydrous minerals (Tagish Lake and Murchison) pressed on aluminum plates and measured by transmission-reflection micro FTIR measurements were found to be contaminated during storage after only one day, as revealed by an increase of ~2965 cm^{-1} and ~1260 cm^{-1} peaks. The Moss meteorite which contains no hydrous minerals, did not show an increase of these peaks, indicating no organic contamination. This difference is probably related to the differing mineralogy and physical properties (including porosity and permeability) of these chondrites.

Hydrous minerals such as antigorite, muscovite, montmorillonite and silica gel showed organic contamination by the same infrared measurements, while anhydrous materials such as SiO_2 and KBr showed no contamination. These results indicate importance of surface OH groups for the organic contamination.

Organic contamination was found on silica gel samples pressed on aluminum plates when they were stored within containers including silicone rubber, silicone grease or adhesive tape.

Long path gas cell FTIR measurements for silicone rubber indicated methylsiloxane oligomers were released from the silicone rubber.

In-situ heating infrared measurements on the contaminated antigorite and Tagish Lake showed decrease of the 1262 cm^{-1} (Si-CH_3) and 2963 cm^{-1} (CH_3) peaks from room temperature to 200-300^{o}C indicating desorption of volatile contaminants.

These results indicate that careful preparation and storage are essential for FTIR measurements on precious astromaterial samples such as meteorites, IDPs and samples returned from comets, asteroids and Mars. Every possible contamination source should be evaluated before anything is done to these samples.