CHARACTERISTICS OF PHYLLOSILICATES IN MICROMETEORITES DERIVED FROM SYNCHROTRON X-RAY DIFFRACTION ANALYSIS.
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Introduction: Micrometeorites have many mineralogical and compositional features in common with hydrous carbonaceous chondrites [e.g., 1]. However, hydrous phases in micrometeorites easily decompose to amorphous materials or secondary anhydrous minerals during heating at parental objects and terrestrial atmosphere, because they are very susceptible to thermal effects. As a result, only limited number of micrometeorites retain phyllosilicates [2]. But micrometeorites with phyllosilicates are key objects for identification of parental objects and elucidation of the origin of interplanetary dust. We have continued characterization of bulk mineralogy of micrometeorites using combined techniques [3]: synchrotron X-ray diffraction of individual micrometeorites and transmission electron microscopy of ultramicrotomed slices of the X-rayed micrometeorites.

Results and discussion: We have selected 2500 samples of micrometeorites mainly from the JARE 39 and JARE 41 collections [e.g., 4]. Then samples that experienced heavy heating were excluded based on the textures of sample surfaces, because such samples have no possibility to have escaped phyllosilicate decomposition. Approximately 300 samples survived the elimination process and were individually exposed to X-rays for the diffraction analysis, and 40 samples have been identified as phyllosilicate-rich micrometeorites. They show clear 001 basal reflections and prism reflections of saponite and/or serpentine, which indicates that phyllosilicates are a major component in these micrometeorites.

Among 40 phyllosilicate-rich samples, the relative abundance between saponite and serpentine varies greatly, but predominant phyllosilicate is saponite: 28 samples contain only saponite, 5 samples contain only serpentine, and the remaining 7 samples contain both saponite and serpentine. The relative abundance of phyllosilicates is a measure for the identification of parental objects: Tagish Lake chondrite is dominated by saponite, CM chondrites are dominated by serpentine, and CI and CR chondrites contain both phyllosilicates. Our results thus indicate that the phyllosilicate variation of micrometeorites covers a whole range of carbonaceous chondrites and further implies that micrometeorites with saponite-dominated mineralogy is one of the main components in interplanetary dust, which shows a clear contrast to the very rare occurrence of saponite-dominated materials (Tagish Lake) as a meteorite-size object.