

Report for the Joint Use/Research of the Institute for Planetary Materials, Okayama University

2022 fiscal year first call / second call / others

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Category: International Joint Research / General Joint Research / Joint Use of Facility / Workshop

Name of the research project: Liberation of organic compounds from carbonaceous chondrites in early Earth's hot spring environments

Principal applicant: Alexandra Zetterlind

Affiliated institution and department: Utrecht University, Department of Earth Sciences

Collaborator

Name: Dr. Christian Potiszil

Affiliated institution and department: Okayama University, Institute for Planetary Materials

Research report:

The conducted work at the Institute for Planetary Materials, Okayama University serves as a key component of my doctoral project, which aims to understand if organic molecules can be liberated from carbonaceous chondrites (CC) into aqueous environments, such as those of Hadean Earth's water bodies. Through this international collaboration with Dr. Christian Potiszil, the aim was to obtain the basic training on meteoritic organics' extraction line, develop 1) cleaning protocols to prevent potential contamination and 2) analytical protocols suitable for the compounds of interest, particularly, amino acids. Thereafter, to perform first analyses with 1) DESI-OT-MS on pieces of the CC samples and 2) UHPLC-OT-MS on pristine solid samples of a set of CCs as well as the first Tarda meteorite aqueous leachates and solid residues.

I successfully completed the training and learned the cleaning and analytical protocols needed for work with extraterrestrial samples. I prepared and extracted pristine solid samples of the set of CCs, although background contamination in extracts was higher than desired. We successfully performed UHPL-OT-MS analyses on the Tarda aqueous leachates and currently analyzing the corresponding residue samples. The unique in situ organic measurement capabilities at the IPM give us insights into compound specific leaching, namely we were able to detect and measure the abundance of amino acids. The obtained results may propose that CCs could indeed be deliverers of essential organic compounds necessary for life on Earth. After completed data analysis, we aim to publish outcomes in a scientific article. DESI-OT-MS was out of order during my visit and hence this analysis had to be postponed.