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Analysis of amino acids in small particles captured with aerogel

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Amino acids have been detected in such extraterrestrial bodies as carbonaceous chondrites and comets, and their relevance to the origin of life on the Earth is discussed. We are planning a space experiment named the Tanpopo Mission, where several experiments including capture of space dusts and exposure of organic compounds and microorganisms. As to the capture experiments, several aerogel blocks will be attached on several faces of an integrated experimental rack that will be placed on JEM/EF of ISS. High-speed dusts will make tracks in the aerogel. After recovering them to the Earth, we will separate each track with a terminal grain, and will apply to chemical analysis, including microscopic techniques (FT-IR, STXM-XANES, etc.) and amino acid enantiomers analysis after acid hydrolysis.

Amino acid is one of the main target molecules to be found in the capture experiments. We have tested whether hypervelocity dusts can be trapped in aerogel by using a two-stage light gas gun equipped in JAXA/ISAS. Samples such as amino acids adsorbed to porous silica gel and powder of Murchison meteorite were shot out at 4 - 6 km/s, and were captured in an aerogel to see whether organics could be recovered in the terminal grains or tracks. The aerogel block containing tracks of high-velocity particles was digested with HF-HNO, in a Teflon container. The digested solution was then acid-hydrolyzed with 6 M HCl, was desalted with a solid-state extraction column (MonoSpin SCX), and amino acids were determined by cation-exchange HPLC after post-column derivatization for fluorometric detection.

It is of quite importance to reduce amino acids in a procedural blank. The current situation in reducing the procedural blank will be presented.

Keywords: the Tanpopo Mission, interplanetary dust particles, small particles, microorganisms, aerogel, amino acids