[EE] Evening Poster | B (Biogeosciences) | B-AO Astrobiology & the Origin of Life

[B-AO01]Astrobiology

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Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
Twenty years have passed since when the field of Astrobiology, which aims to unveil the origins, evolution, and habitability of life by integrating multidisciplinary fields, was established. Origins of Life are currently being re-conceptualized via expansion of prebiotic chemistry to systems chemistry and chemical space. Besides their relationship to life's building blocks, it is expected to demonstrate the significant roles of organic molecules in the history of planetary formation. The linkages among the variations in chemical compositions of deep-sea hydrothermal environments, geological settings, and ecological systems were systematically investigated. Cassini, which accomplished in the long-term explorations of the planets bearing liquid, had "Grand Finale" this year. Discoveries of extrasolar planets have been dramatically increased to date.
Originally, Astrobiology does not need a specific science category. We therefore aim to make this session so that Earth and Planetary scientists from all the categories join for discussing 'where we came from and where we are going' and for making novel integrated researches.
For the next stage of Astrobiology, presentations on the instrument development in space explorations, comparative studies of solar system and exoplanets, etc, will be very much welcome.

[BAO01-P07]Influence of existing water ice for pressure-induced formation of alanine oligopeptides at 25 °C

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Oligomerization of amino acids can provide a clue to the origin of life because it is a fundamental step of protein synthesis. Under high pressure, increases of intermolecular interactions result in chemical reaction which cannot proceed under ambient condition. Oligomerization of amino acids was reported from experiments under high pressure and high temperature conditions simulating impact of comets, hydrothermal vents, diagenesis in sub-seafloor sedimentary environments (e.g., Sugahara and Mimura, 2015; Imai and Honda, 2010; Otake et al., 2011). In these experiments, both high pressure and high temperature are the important factors for amino acids oligomerization. However, it is unknown which factor is more efficient for forming oligomers. Recently, we focused on exclusive effect of high pressure on oligomerization reaction and reported oligomerization of L-alanine under a room temperature and high-pressure condition (Fujimoto et al., 2015). In Fujimoto et al. (2015), we used alanine powder soaked with its saturated solution for starting material. In other words, alanine peptides formed under high pressure phase of water ice coexisting condition. In the present study, we prepare two different types of starting materials and compare these results to reveal effects of water on peptides formation.

All high-pressure experiments were carried out at 25 °C. Starting material was loaded in a high-pressure cell with two different conditions: solid and solution (solid: L-alanine powder. solution: saturated L-alanine aqueous solution.). The samples were compressed using an opposed-anvil apparatus (non-toroidal phi8-5 sintered diamond anvil). The sample volumes were approximately 24 mm^3. The experiments were conducted at pressure of approximately 11 GPa. After decompression to ambient pressure, the samples were dissolved in pure water and analyzed using LC-MS.

Alanine dimer was detected from both run products (solid and solution). It is noteworthy that oligomerization of alanine occurred under solid and solution condition. In the pressure and temperature conditions applied in this study, water in the samples existed as ice VII, a high-pressure phase of water, in other words, the oligomerization observed here was a solid-phase reaction. Also, solid condition provided solid-phase reaction. In the presentation, we will discuss the difference of peptides yields between solid and solution.This study confirmed that oligomerization of amino acids occurs under high pressure at room temperature with existence of water as ice VII which is known to exist in the interiors of icy bodies. This study proposed that interiors of icy bodies can be new abiotic conditions for oligomerization of amino acids.