Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

BCG28-P02 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

衝撃波によるストレッカー型アミノ酸合成の実験的検討
Shock-induced Strecker Reactions for prebiotic amino acid formation: Experimental simulations

梅田 悠平 [1*] ; 永露 健太 [1] ; 関根 利守 [1] ; 網本 智子 [1] ; 小林 敬道 [2]
UMEDA, Yuhei[1*] ; EIRO, Kenta[1] ; SEKINE, Toshimori[1] ; AMIMOTO, Tomoko[1] ; KOBAYASHI, Takamichi[2]

[1] 広島大学理学研究科, [2] 物質材料研究機構
[1]Graduate School of Science, Hiroshima University, [2]National Institute for Materials Science

Amino acid is thought to be one of the most primary biomolecules related to the origin of life. The prebiotic syntheses of amino acids under early Earth condition were simulated in experiments using by several energies such as electric discharge, light, heat and shock wave. According to a previous study by Aubrey et al., 2009, it is considered that amino acid formation from ammonium formate (NH_4HCO_2) depends mainly on concentration of starting materials. It has been known that ammonium formate can produce HCN above 180 ^oC, and that HCN is a necessary material in order to synthesize amino acid via strecker reaction. Strecker reaction is used for syntheses of amino acids in the presence of NH_3 and HCN. These molecules can be easily formed from ammonium formate at high temperature. They performed hydrothermal experiments at concentrations of 0.1 M and 0.001 M. Then, amino acids such as glycine and alanine were formed from only a high concentration sample (0.1 M). However, this concentration is unrealistically too high for natural marine conditions. We need to know the effect of shock energy on the formation.

In this study, we carried out shock recovery experiments using a propellant gun for aqueous solutions of ammonium formate and formamide. Starting material, encapsulated in steel container as a target, was ammonium formate or formamide aqueous solution immersed in the pressed olivine powder. We used two concentrations (5 mM and 100 mM) to compare with the results of hydrothermal experiments. Olivine was simulated as ordinary chondrite. The peak pressure in this study was about 5 GPa. Recovered solutions were analyzed by using hybrid/MS for biomolecules of the m/z values between 50 and 500 with analytical errors within 3 mmu (0.003). The results indicated that glycine and glycylglycine were detected in all samples and that benzoic acid as carboxylic acid was detected in only formamide samples. Present results suggest that glycine formation by shock reaction might be more effective than that of hydrothermal reaction because glycine was formed from low concentration samples. Detailed discussions will be given as poster.

Keywords: Marine meteorite impact, Amino acids, Strecker reactions