[EE] Eveningポスター発表 | セッション記号 B (地球生命科学) | B-AO 宇宙生物学・生命起源

[B-AO01]アストロバイオロジー

コンビーナ:薮田 ひかる(広島大学大学院理学研究科地球惑星システム学専攻)、杉田 精司(東京大学大学院理学系研究科地球惑星科学専攻)、深川 美里(名古屋大学、共同)、藤島 皓介(東京工業大学地球生命研究所)
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化学・生物学・地質学・天文学などの様々な分野を横断し、宇宙における生命の起源と進化、生命存在可能性の解明を目的とするアストロバイオロジーが1998年に発祥してから20年。前生物的化学は今日、分子相互作用の複雑ネットワーク解析にまで拡張され、生命起源が再概念化されつつある。地球外有機物は生命起源との結びつきに甘んじず、惑星形成において不可欠な役割実証が期待されている。極限環境生物学では海底熱水組成の多様性と地質・生態系との関係性が理論体系的に解明され、惑星科学では液体を保持する惑星のダイナミクスを観測し続けたカッシーニが今年、最後のミッションを果たした。系外惑星の発見は今日も劇的なスピードで増加し続けている。
アストロバイオロジーは本来特定のセクションにとどまらない学問であるので、我々はどこから来てどこへ行くのかの解明に関わる全てのセクションの地球惑星科学者による発表を歓迎し、新たな分野融合研究を生み出すことのできる場としたい。また、この分野の新展開に臨むにあたり、宇宙生命探査における機器開発や太陽系内・系外惑星の融合研究に関わる発表を歓迎します。

[BAO01-P02]彗星衝突を模擬した衝撃実験によって合成された LL過剰ペプチド

*岡田 陸[1]、三村 耕一[1]、西田 民人[1] (1.名古屋大学)
キーワード：L体過剰アミノ酸、LL体過剰ペプチド、生命の起源、彗星、衝撃圧縮、ホモキラリティー

Terrestrial organisms have the biological homochirality that uses L-amino acids and D-sugars selectively in biomolecules. Because the homochirality is essential for organisms to form higher-order structures of proteins and to activate enzymes, the homochirality is considered to be an inherent feature also in primitive organisms on the early earth. Therefore, to examine the origin of life, it is necessary to comprehensively discuss the evolution of homochirality as well as the chemical evolution. Because abiotic L-enantiomeric excess (L-ee) amino acids were reported only from carbonaceous meteorites in nature, the L-ee amino acids have been thought as triggers of the evolution of homochirality.

In order to examine the behavior of L-ee amino acids under the impact of bodies on the early earth, we performed the shock experiments of L-alanine solution simulating the impact of comets, which are thought to contain many organic materials similar to that of carbonaceous chondrites. Shock pressure (6.5-34 GPa) and shock temperature (500-887 K) were calculated using one-dimensional impedance matching method. Recovered samples were derivatized (esterification and acylation) and analyzed with GC-FID and GC-MS.

Alanine and dialanine were detected in shocked samples. With increasing shock temperature, while abundance and L-ee ({(L-D) / (L+D)} * 100 (%)) of survived alanine were decreased, LL-ee dialanine were produced. LL-peptides have been considered to be important in the evolution processes for the origin of life since they act as catalysts for polymerization of biomaterials and selective synthesis of D-sugars. Furthermore, interestingly, LL-ee ({(LL-DD) / (LL+DD)} * 100 (%)) shows greater values than L-ee at same shock conditions. The ee amplification process of amino acids by recrystallization has been proposed, but there is no report of the ee amplification of peptides during polymerization process. The results of this study suggest that comet impacts had been important process for origin of life because

the chemical evolution to form peptides and the development of homochirality to amplify the ee are occurred simultaneously.

Considering the frequency distribution of impact velocity of comets in nature, about 10% of all comet impact numbers experienced the shock conditions of this experiments. Also, considering the deceleration of impact velocity by Earth’s atmosphere, the shock conditions of this experiments would have occurred sufficiently even in nature. From these results, comet impacts have not only supplied L-ee amino acids and LL-ee peptides, which are important for the origin of life, to the early earth, but also important events that could resolve simultaneously the homochirality and the chemical evolution.