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POSSIBLE FORMATION OF AMINO ACIDS PRECURSORS IN TITAN BY COSMIC RAYS

Toshinori Taniuchi¹, Hakam Al-Hanbali¹, Takeo Kaneko¹, Yoshinori Takano², Shin Miyakawa³, Akira Yamori⁴ and Kensei Kobayashi¹

¹Department of Chemistry and Biotechnology, Yokohama National University, Yokohama 240-8501, Japan e-mail: kkensei@ynu.ac.jp

²Graduate School of Science, Hokkaido University, Sapporo 060-0810, Japan

³Institute of Medical Science, University of Tokyo, Tokyo 108-8639, Japan

⁴Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagami-hara 229-8510, Japan

Titan is the biggest satellite of Saturn, and has dense atmosphere that mainly consists of nitrogen and methane. Observation of Titan by Huygens probe in 2005 implied that there were water ice and liquid methane on Titan surface. It has been expected that Titan gives very important information about the origin of life on the early Earth, so that various kinds of experiments simulating Titan's environments have been done. Among various kinds of energy sources in Titan atmosphere, cosmic rays can penetrate deeply down to the surface, which could be most effective to produce organic compounds on the surface of Titan. In the present study, we examined possible formation of bioorganic compounds in lower Titan atmosphere.

A mixture of methane (1-10%) and nitrogen (balance) was irradiated with 3 MeV-protons from a van de Graaff accelerator. Solid product ("*tholin*") was acid-hydrolyzed, and amino acids in the hydrolysate was quantified by HPLC. Amino acids were also analyzed by GC/MS with a chiral column after derivatization by using chroloformate. Molecular weight of the product before hydrolysis was estimated by gel permeation chromatography (GPC).

The GPC results showed that the *tholin* had molecular weight of ca. 1700 and 900. Various amino acids were detected in *tholin* after acid hydrolysis: Glycine was predominant, whose G-value was 0.006 when 1% methane was used. Indigenoussness of amino acids was checked with their D/L ratio and/or by using ¹³CH₄ as a carbon. It was suggested that cosmic rays-induced *tholin* could give amino acids after interaction with surface water ice and/or cometary water ice during meteoritic / cometary impacts.