

Verification of abiotic formation of bioorganic compounds by utilizing Low Earth orbital environment

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In prior to the generation of the first terrestrial life, formation of bioorganic compounds such as amino acids seems to have been essential. There were two possible organic sources for that: Endogenously formed organic compounds and extraterrestrial organic compounds delivered by small bodies. Previously organic compounds could be formed effectively from strongly reducing atmospheres. In these days, however, it was suggested that the endogenous formation was limited since primitive Earth atmosphere would have been only mildly reducing: Conventional energies such as thundering was not effective for the synthesis. On the other hand, laboratory simulations showed that cosmic ray was a possible energy source to form nitrogen-containing organics including amino acids from even only slightly reducing atmospheres. We proposed to expose mildly reducing gas mixture to the environment of low Earth orbit to see chemical evolution toward origins of life could take place without adding artificial energies. Gas mixtures, such as a mixture of methane (5%) and nitrogen (95%) will be sealed in mall gas cells with or without MgF₂ windows, and attached to the Ex-HAM facility equipped on the Exposed Facility of JEM, and exposed to cosmic rays and/or solar UV for more than a year. It is expected the formation of amino acid precursors by the action of cosmic rays and the enhancement of the yield by solar UV. The other possible experiments by using Ex-HAM were also discussed.

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