Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

BAO01-P05 Room:Convention Hall Time:May 24 15:30-17:00

Effects of salt on organic molecule formations by oceanic impacts on early Earth

SUZUKI, Chizuka[1*], FURUKAWA, Yoshihiro[1], Takamichi Kobayashi[2], KAKEGAWA, Takeshi[1]

[1]Graduate School of Science, Tohoku University, [2]High Pressure Group, National Institute for Materials Science

When the surface of Hadean Earth solidified, it is thought that the atmosphere of the Earth was composed mostly carbon dioxide and nitrogen (Kasting and Howard, 1993). It has been suggested that one of the process to supply organic molecule on early Earth was the oceanic impact. It was suggested that amines, carboxylic acids, and glycine were formed by the shock-recovery experiments simulating oceanic impact on early Earth (Furukawa et al., 2009). The previous study used starting materials comprising mixture of iron, nickel, carbon (13C), and gaseous nitrogen or ammonia. However, no previous study has examined effects of brine composition on the formation of organic molecules by oceanic impact. In this study, shock-recovery experiments were performed with a single-stage propellant gun to investigate the effects of ionic strength on the formation of organic compounds by oceanic impact on early Earth. We used starting materials comprising mixture of iron, nickel, carbon (13C), gaseous nitrogen, and sodium chloride solution or water. After the impact experiments, soluble organic compounds were extracted into water and analyzed amines, amino acids, and ammonia by liquid chromatography-mass spectrometer (LC/MS). Solid materials were analyzed using X-ray powder diffractometry (XRD) after drying. Glycine, methylamine, ethylamine, and propylamine whose carbons are composed of 13C were identified in the sample free from sodium chloride. While, only 13C-methylamine and 13C-ethylamine were identified in the sample containing sodium chloride. Iron was more oxidized in the sample containing sodium chloride. This suggests that more ammonia was formed in the sample containing sodium chloride. On the other hand, yields of amines in the sample free from sodium chloride were higher than those containing sodium chloride. This suggests that sodium chloride restricted the reaction to form alkyl chain or reactions between ammonia and hydrocarbons. The present results suggest that sodium chloride restricts the reactions forming organic molecules by oceanic impact on early Earth.