

[JJ] Evening Poster | B (Biogeosciences) | B-BG Biogeosciences & Geosphere-Biosphere Interactions

[B-BG02] Interrelation between Life, Water, Mineral, and Atmosphere

convener: Ken Takai (Extremobiosphere Research Center, Japan Agency for Marine-Earth Science & Technology), Kentaro Nakamura (Department of Systems Innovation, School of Engineering, University of Tokyo), Yuichiro Ueno (東京工業大学大学院地球惑星科学専攻, 共同), Yohey Suzuki (Graduate School of Science, The University of Tokyo)

Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Life on Earth is based on a diversity of physical and chemical dynamics and processes throughout the history. Interaction between life, water, mineral (rock) and atmosphere is a key to understand co-evolution of Life and Earth. It is a brief since the pioneers proposed this session almost 20 years ago. Current JpGU meeting is filled with international- and interdisciplinary-joint sessions with similar aims to this session in responding to surrounding situations of JpGU and earth science field in Japan. Conveners believe that this session has provided an excellent opportunity to discuss such interdisciplinary research results and directions for about 20 years but are also afraid if this session may complete the initial goal. It is a matter for JpGU members to decide. This is a final call whether this session will continue in future. If you need this session, you will submit abstract of your research to this session for oral presentation with your intension. If we have less than 12 abstracts for oral presentation, we will cease this session in 2018. Join to this session!

[BBG02-P02] Adsorption structure of stearic-acid molecules on a calcite surface in ethanol and artificial sea water

*Hiroshi Sakuma¹, Jun Kawano² (1.National Institute for Materials Science, 2.Hokkaido University)

Keywords: Electron density, Oil recovery, Salt water, Mineral-water interaction

Artificial sea water has been considered to improve the oil recovery from chalk. Presence of Ca^{2+} , Mg^{2+} , and SO_4^{2-} ions in the water can improve the oil recovery [1], and the mechanism has been considered by the surface tension alteration induced by these ion substitutions of the calcite surface [2,3]. To confirm the mechanism proposed by these theoretical calculations, it is required to reveal the adsorption structure of oil molecules on a carbonate surface in water.

Here, we conducted the surface X-ray scattering measurements of calcite/oil model compound interface in ethanol and artificial sea water. Stearic acid ($\text{C}_{18}\text{H}_{36}\text{O}_2$) was used as a model compound of oil molecules. These experiments were performed at the KEK-PF BL-4C.

The X-ray scattering intensity of the interface in ethanol oscillated at low momentum transfer (Q) values, which is consistent with the interface in methanol [4]. This oscillation would be ascribed to the presence of stearic-acid monolayer. Such oscillation was observed at the interface in artificial sea water; however, the oscillation period was different from that in ethanol. This indicates that the adsorption structure is altered by the change of solution from ethanol to artificial sea water. The oscillation of the X-ray scattering intensity in the artificial sea water was diminished with time and this can be interpreted by the desorption of stearic acid from the surface owing to the acidification of solution by the X ray [5].

We discuss the adsorption structure of stearic acid and the effect of surrounding solution based on these results and the analysis using a structural model.

References

- [1] Zhang, Tweheyo, Austad (2007) *Colloid Surf. A*, **301**, 199-208.
- [2] Sakuma, Andersson, Bechgaard, Stipp (2014) *J. Phys. Chem. C*, **118**, 3078-3087.
- [3] Andersson, Dideriksen, Sakuma, Stipp (2016) *Sci. Rep.*, **6**, 28854.
- [4] Fenter, Sturchio (1999) *Geochim. Cosmochim. Acta*, **63**, 3145-3152.
- [5] Laanait, Callagon, Zhang, Sturchio, Lee, Fenter (2015) *Science*, **349**, 1330-1334.