The 10th Global-COE International Frontier Seminar

July 22nd, 2009, from 17:00, at the room# 486 meeting room 4F

Magma to Molecules: Simulation of Abiotic Organic Synthesis at Mid-Ocean Ridge Seafloor Hydrothermal Systems

John R. Holloway

Institute for Geothermal Sciences, Graduate School of Science, Kyoto University
&
Dept. of Chemistry & Biochemistry, and School of Earth and Space Exploration Arizona State University

The intrusion and extrusion of mid-ocean ridge basalt (MORB) magmas at and below the mid-ocean ridge results in production of significant quantities of CO_2 and H_2, creating a fluid in a highly disequilibrium redox state. The CO_2 results from degassing of volatile oversaturated magma; and the H_2 is produced by reaction of dissolved H_2O with FeO in the magma as it crystallizes (Holloway & O'Day, 2000).A series of rapid flow experiments at seafloor hydrothermal system conditions demonstrate that reaction of CO_2 and H_2 in the presence of magnetite forms significant amounts of methanol (Voglesonger, et al., (2001)A second flow experiment showed that MORB glass reacts within days to form smectite clay at seafloor hydrothermal system conditions. A series of static experiments lasting from one day to 6 weeks demonstrated that smectite clay interlayers completely collapse in that time period (Williams, et a.l,, 2001).A second set of static experiments found that aqueous methanol in contact with smectite clay at SFHS pressure-temperature conditions forms a wide variety of complex organic compounds, and the time dependence of compound synthesis correlates with the collapse of the smectite layers. The most abundant of the compounds is a hexagonal carbon ring molecule, hexamethyl benzene (Williams, et a.l,, 2005). This series of experiments demonstrate the organic synthesis reactions could have occurred in a prebiotic ocean on early Earth.

22 July 2009 17:00-18:00
Room 486, meeting room 4F
Sogo-Kenkyu-to Bldg 1
Ehime University

EHIME UNIVERSITY GRC GEODYNAMICS RESEARCH CENTER

Contact: T. Irifune
irifune@dpc.ehime-u.ac.jp
http://www.ehime-u.ac.jp/~grc