Geophysical Research Abstracts
Vol. 15, EGU2013-22, 2013
EGU General Assembly 2013

Geochemical Origin of Biological Molecules

Marie-Paule Bassez

IUT, Université de Strasbourg, ILLKIRCH, France (marie-paule.bassez@unistra.fr) http://chemphys.u-strasbg.fr/mpb

A model for the geochemical origin of biological molecules is presented. Rocks such as peridotites and basalts, which contain ferromagnesian minerals, evolve in the presence of water. Their hydrolysis is an exothermic reaction which generates heat and a release of H2 and of minerals with modified structures. The hydrogen reacts with the CO_2 embedded inside the rock or with the CO_2 of the environment to form CO in an hydrothermal process. With the N2 of the environment, and with an activation source arising from cosmic radiation, ferromagnesian rocks might evolve towards the abiotic formation of biological molecules, such as peptide like macromolecules which produce amino acids after acid hydrolysis.

The reactions concerned are described. The production of hydrothermal CO is discussed in geological sites containing ferromagnesian silicate minerals and the low intensity of the Earth's magnetic field during Paleoarchaean Era is also discussed. It is concluded that excitation sources arising from cosmic radiation were much more abundant during Paleoarchaean Era and that macromolecular structures of biological relevance might consequently form during Archaean Eon, as a product of the chemical evolution of the rocks and of their mineral contents. This synthesis of abiotically formed biological molecules is consecutively discussed for meteorites and other planets such as Mars.

This model for the geochemical origin of biological molecules has first been proposed in 2008 in the context of reactions involving catalysers such as kaolinite [Bassez 2008a] and then presented in conferences and articles [Bassez 2008b, 2009, 2012; Bassez et al. 2009a to 2012b].

BASSEZ M.P. 2008a Synthèse prébiotique dans les conditions hydrothermales, CNRIUT'08, Lyon 29-30/05/2008, Conf. and open access article:http://liris.cnrs.fr/∼cnriut08/actes/ 29 mai 11h-12h40.

BASSEZ M.P. 2008b Prebiotic synthesis under hydrothermal conditions, ISSOL'08, P2-6, Firenze-Italy, 24-29/08/2008. Poster at the Conference and abstract in OLEB, 2008, 39 (3-4) 223.

BASSEZ M.P. 2009 Prebiotic synthesis under hydothermal conditions, C. R. Chimie, Académie des Sciences, Paris 12 (6-7) : 801-807.

BASSEZ M.P. 2012 A model for a geochemical origin of life in preparation

BASSEZ M.P., TAKANO Y., OHKOUCHI N. 2009a Organic analysis of peridotite rocks from Ashadze and Logatchev hydrothermal sites, Int. J. Mol. Sci. 10(7): 2986-2998.

BASSEZ M.P., TAKANO Y., OHKOUCHI N. 2009b Organic analysis of peridotite rocks from the MAR, AGU fall meeting, P43C-1441, San Francisco, 14-18/12/2009.

BASSEZ M.P., TAKANO Y. 2010a Prebiotic organic globules, Nature Precedings: Posted 21 Jul http://hdl:10101/npre.2010.4694.1.

BASSEZ M.P., TAKANO Y., OHKOUCHI N. 2010b Organic analysis of peridotite rocks, First chemical steps towards the Origin of Life colloquium, Turin 16-17/09/2010.

BASSEZ M.P., TAKANO Y., OHKOUCHI N. 2011a A search for prebiotic molecular signatures inside rocks, Geobiology in Space exploration workshop, P sans n°, Marrakech 07-14/02/2011.

BASSEZ M.P., TAKANO Y., OHKOUCHI N. 2011b Detection of molecular biosignatures inside rocks, Origins 2011 ISSOL and Bioastronomy conference, P2-17, Montpellier, 04-08/07/2011.

BASSEZ M.P., TAKANO Y., 2011c Organic microstructures, Origins 2011 ISSOL and Bioastronomy conference, P2-34, Montpellier, 04-08/07/2011.

BASSEZ M.P., TAKANO Y. KOBAYASHI K. 2011d Prebiotic organic microstructures, Nature Precedings: Posted 14 Nov. http://hdl.handle.net/10101/npre.2011.4694.2

BASSEZ M.P., TAKANO Y., KOBAYASHI K. 2012a Prebiotic organic microstructures, Origin of Life Gordon Research Conference P4, Galveston, 08-13/01/2012.

BASSEZ M.P., TAKANO Y., KOBAYASHI K. 2012b Prebiotic organic microstructures, Orig. Life Evol. Biosph. 42 (4) : 307-316.