July 16-21, 2017 at UC San Diego, CA, USA

Geobiotropy: the Evolution of Rocks in Symbiosis with Prebiotic Chemistry

M. P. Bassez[1]
[1]Université de Strasbourg, Institute of Technology
marie-paule.bassez@unistra.fr
http://chemphys.u-strasbg.fr/mpb

In their interaction with water, minerals inside rocks transform with production of elements and small molecules which intervene in prebiotic syntheses. There is a chemical evolution between the world of rocks and the world of life.

One question arises: Which minerals produced by rocks are signatures for the syntheses of components of life? A contributed answer is proposed: It is based on calculations of thermodynamic functions for elementary equations of carbonation and hydrolysis of Fe(II)Mg- silicates and Fe(II)- monosulfides which compose minerals such as olivine and pyroxenes. The analyses of 4 E-pH redox diagrams, published for corrosion purposes, fulfil the thermodynamic study for anoxic and oxic water. A table is drawn with the minerals which can be signatures of prebiotic synthesis: the geobiotropic minerals.

Several terrains of the solar system are discussed. The minerals in the Tagish Lake meteorite may result from anoxic carbonation and hydrolysis of Fe(II)Mg- silicates and Fe(II)- monosufides. The high T(~350 °C) low pH(3-4) hydrothermal vents of the oceans ridges, may result from anoxic hydrolyses of Fe(II)- monosulfides such as mackinawite, troilite and pyrrhotite. Cases of anoxic and oxic oxydations are discussed for Mars.

A special case of prebiotic synthesis may be observed inside pores of radioactive rocks containing fluids such as H_2, CO_2, N_2 and H_2O and located near uranium radionuclides. Amino acid analytical chemistry, using GC-MS and derivatization methods, is currently under preparation on "bitumen" samples which are observed nearby fluid inclusions of radioactive rocks. Results may be given at the conference. A scenario concerning prebiotic chemistry inside pores containing water, H_2, CO_2, N_2, and located next to radionuclides, is proposed.

References:

Bassez MP (2017) *Origins of Life and Evolution of Biospheres*, on line: 31 March, http://rdcu.be/qxSs
DOI 10.1007/s11084-017-9534-5 (and refs of MP Bassez herein).