

Release of silica from micas by alkaliphilic anaerobes

D. G. ZAVARZINA^{1*}, A. V. SAVENKO²,
N. I. CHISTYAKOVA³, A. A. SHAPKIN³, T. N. ZHILINA¹
AND G. A. ZAVARZIN¹

¹Winogradsky Institute of Microbiology RAS, Moscow
117312, Prospect 60-letiya Oktyabrya 7/2, Russia
(*correspondence: zavarzinatwo@mail.ru)

^{2,3} Lomonosov Moscow State University,

²Geographic and ³Physics Depart., Leninskie Gory, Moscow
119992, Russia

Soda deposits are formed at the final stages of continental CO₂-weathering. It could occur under alkaline conditions either chemically, which seems favorable, or biotically. There are two main groups of alkaliphilic microbial agents that act in anaerobic conditions on the water-rock contact: a) fermentative hydrolytic decomposers of particulate organic matter, e.g. cellulose, capable to produce organic acids as the products of metabolism; b) respiratory anaerobes, utilizing dissolved compounds with external electron acceptors.

We studied the interaction of pure cultures of microbes with biotite and glauconite during 165 days under alkaline conditions at pH 9.5 and total mineralization was 15 g/l. Mössbauer spectroscopy, IR-spectroscopy and solubility of micas in water were used for the investigation of the solid phase. Fermentation products were recorded during the bacterial growth.

Following combinations were studied: (i) chemical alkalinolysis of micas under sterile conditions; (ii) biotic alkalinolysis of micas by alkaliphilic *Clostridium alkalicellulosi* [1], which produces organic acids and ethanol from cellulose; (iii) biotic alkalinolysis by alkaliphilic dissimilatory iron-reducer *Geoalkalibacter ferrihydriticus* [2] with acetate as an electron donor; (iiii) combined binary culture of *Cl. alkalicellulosi* and *G. ferrihydriticus* with cellulose as organic substrate.

Release of silica under experimental conditions for the both minerals was as following: (i) no release; (ii) no release; (iii) release of silica, formation of new soluble phase; (iiii) release of silica, formation of new soluble phase.

It is proposed that the anaerobes with respiratory metabolism are more effective than fermentative in bioweathering of rock-forming minerals as micas with release of silica. Chemical weathering even under most favorable conditions is far less pronounced than microbe-mineral interactions.

[1] Zhilina *et al.* (2005) *Microbiology*, **74**, 642-653. [2] Zavarzina *et al.* (2006) *Microbiology*, **75**, 775-785.

Evidence for evolution of growth media in superdeep diamonds from Sao-Luis (Brasil)

D.A. ZEDGENIZOV^{1*}, A.L. RAGOZIN¹, V.S. SHATSKY¹,
H. KAGI², S. ODAKE², W.L. GRIFFIN³, D. ARAUJO³ AND
O.P. YURYEVA¹

¹V.S. Sobolev Institute of Geology and Mineralogy, 3
Koptuyuga ave., 630090, Novosibirsk, Russia
(*correspondence: zed@igm.nsc.ru)

²Geochemical Research Center, Graduate School of Science,
University of Tokyo, Tokyo 113-0033, Japan

³GEMOC ARC National Key Centre, Macquarie University,
NSW 2109, Australia

Diamonds from Sao-Luis (Brazil) are known to be originated from the depths of transition zone and lower mantle [1]. In this study we consider some aspects of the composition and evolution of growth media for diamonds from this locality.

CL imaging has revealed the complex growth history for most diamonds, reflecting their formation in several stages. Nitrogen content in an individual diamonds varies from several to 500 ppm. An apparent tendency for the 3107 cm⁻¹ peak intensity to increase with increasing the nitrogen content gives support to the idea that the conditions favouring the incorporation of nitrogen in these diamonds might also favour the incorporation of hydrogen. Specific feature of diamonds from Sao-Luis is extremely high nitrogen aggregation state (90-100 %B1). The set of luminescence centers N3, H3, H4, 490.7 is typical for all diamonds. Radiation-induced centers with peaks at 536 and 576 nm are often observed.

The total range of carbon isotope composition in diamonds studied by SIMS makes up from -3.3 to -20.3 ‰ of δ¹³C. Some diamonds show local variations of δ¹³C between different growth zones (up to 7 ‰).

The dominant inclusions in studied diamonds are CaSi-perovskite and AlSi-phases. MgSi- and CaTi-perovskites, ferropicriolite, native iron, coesite and zircon have also been found. Raman shift of coesite peak show high residual pressure (>3 GPa at ambient temperature).

FTIR study of some microinclusion-bearing diamonds showed that water and carbonates are not major components of diamond-forming fluids. LA-ICPMS bulk composition has significant enrichment in Ca, Fe and Al and strong depletion in Mg. Trace elements show general enrichment in Ti and V and depletion in Sr, LREE and Ni. Most probable source for such environments might be fluids from deeply subducted rocks of metasomatized oceanic lithosphere.

[1] Kaminsky *et al.* (2001) *Contrib. Miner. Petrol.* **140**, 734-753.