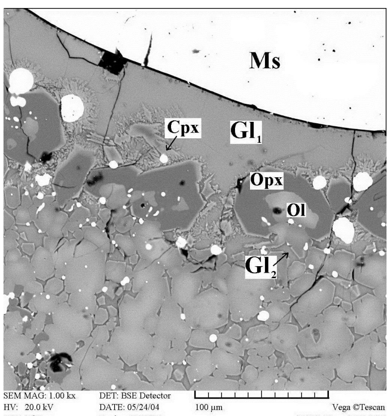
Slab-mantle interaction and petrogenesis of interplate basalts

N.S. GORBACHEV, D.M. SULTANOV AND A.I. NEKRASOV

Institute of Experimental Mineralogy of RAS (gor@iem.ac.ru)

Interplate basalts have been produced from mantle reservoirs which content of protholiths of former oceanic crust. The peculiarity melting of these sources were studied experimentally at temperature range 1250-1400ºC and pressure 1.5-4.0 GPa by using the peridotite ampoule method. In peridotite-basalt-volatile (H_2O or H_2O+CO_2) systems (PBV) as the model such reservoirs high magnesian melts (14-18 % MgO) in equilibrium with Opx+Cpx formed by react slab-derived liquids with mantle peridotite (“reaction” melts). Their volume depend on volume basalt of slab. In the some experiments during partial melting of peridotite formed 3-5 % ”filmy” andesitic or more high siliceous (up to 60 % SiO_2) liquids.

Figure 1: Photo of experimental sample in the backscattered electrons. T=1250 C, P=2.5 GPa, 5% H_2O+CO_2



Make allowance of volume slab basalts my proposed, that the slab-mantle sources would be produced more bigger volumes of magnesian basalts at comparatively lover temperatures to compare with normal partial melting of peridotite. All these observations, based on experimental study PBV systems, probably may extent to petrogenesis of interplate basalts.

RFBR № 06-05-64895, OSE RAS . 7-I.1

Bacterial nanowires: Extracellular electron transfer and mineral transformation

YURI A. GORBY

J. Craig Venter Institute, La Jolla, CA 92035 (ygorby@jcvi.org)

Dissimilatory metal reducing bacteria use solid phase iron and manganese oxides as electron acceptors and couple this enzymatic reduction to growth. This mode of anaerobic respiration profoundly influences mineralogical transformation in diverse natural environments. But the use of metal oxides as electron acceptors presents challenges to bacteria that must coordinate transfer of electrons from bacteria to the mineral surfaces. Recent results demonstrate that metal reducing bacteria, such as *Geobacter* and *Shewanella* spp., produce electrically conductive appendages called bacterial nanowires under conditions that limit availability of electron acceptor (Reguera *et al.*, 2005; Gorby *et al.*, 2006). A combination of scanning electron microscopy (SEM) and scanning tunneling microscopy (STM) confirmed that wild type *S. oneidensis* MR-1 produced electrically conductive nanowires that connected cells together into an electrically integrated cellular network. Conductivity of *Shewanella* nanowires requires the presence of cytochromes, which were previously shown to enzymatically reduce solid phase Fe(III) and Mn(IV) minerals (e.g. Beliaev *et al.*, 2001). Mutants lacking these electron transport proteins produced appendages resembling nanowires that were not conductive. These mutants did not reduce Fe(III) (hydr)oxides, produce electricity in microbial fuel cells, or form thick biofilms (Gorby *et al.*, 2006).

Nanowires are not exclusive to dissimilatory metal reducing bacteria. Organisms ranging from oxygenic cyanobacteria to thermophilic syntrophic bacteria produce electrically conductive nanowires (Gorby *et al.*, 2006). Structure resempling nanowires are commonly observed in iron oxidizing environments. This presentation will provide our current understanding of the diversity, distribution, and implication of bacteiral nanowires in a variety of microorgansisms.

References

Beliaev, A. S., Saffarini, D. A., McLaughlin, J. L., Hunnicutt, D. 2001. *Mol. Microbiol*. **39**: 722-730

Gorby, Y. A., Yanina, S., McLean, J. S., Rosso, K. M., Moyles, D., Dohnalkova, A., Beveridge, T. J., Chang, I. S., Kim, B. H., Kim, K. S., Culley, D. E., Reed, S. B., Romine, M. F., Saffarini, D. A., Hill, E. A., Shi, L., Elias, D. A., Kennedy, D. W., Pinchuk, G., Watanabe, K., Ishii, S., Logan, B., Nealson, K. H., Fredrickson, J. K. 2006. *Proc. Nat. Acad. Sci. USA*. **103**: 11358-11363.

Reguera, G., McCarthy, K. D., Mehta, T., Nicoll, J. S., Tuominen, M. T., Lovley, D. R. 2005. *Nature.* **435**: 1098-1101.