Volcanic and artificial basaltic glasses structure studied by small-angle x-ray scattering

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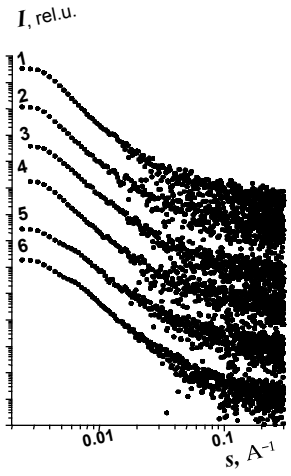
Basaltic rocks are common for Earth and Moon, their melts originate at volcanic, impact and industrial processes. Several samples of basaltic glasses has been studied: a) Tephra glassy particles (45-100 microns) of Large Tolbatchik Fissure Eruption (Kamchatka, Russia, 1975-1976) – No. 5, 6;

b) Disperse glassy fibers, manufactured from natural basalts by air jet fragmentation – No. 1, 2; c) Disperse glassy fibers, manufactured from natural basalts by two-stage technology - No. 3, 4. The special feature of such samples is high-speed air quenching.

Small angle X-ray diffractometer with linear position-sensitive detector was used at wavelength 0,1542 nm. Slit collimation due to Kratky. Angle detection range 0.005 – 8 degrees corresponds to possible structure inhomogenities 1.5-100 nm. The scattering vector module – intensity curves in Porod coordinates are shown on the graph.



The linear trend for 1, 2, 3, 4 curves testifies the absence of typical inhomogenities. The fractal slope is close to critical value –4,0 for silicate polimers.

Volcanic glass samples (5, 6) demonstrate a break on the intensity slope corresponding to 60-100 nm inhomogeneity. The

slope is significantly less than –4.0. We suppose two-stage polimerization with surface-mass fractal transition, following (Schaefer, Keefer, 1986).

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References

Ablesimov N.E., Zemtsov A.N. e.a. (1989), *Int.Conf.on the Appl.of Mössbauer Effect*, Budapest, Hungary, v. 2, 12.75a

Schaefer D.W., Keefer K.D. (1986). In: *Fractals in Physics*. (Russian edition, 1988, 670 p.)

Highly heterogeneous Mesozoic lithospheric mantle beneath the North China Craton: Evidence from Sr-Nd-Pb isotopic systematics of mafic rocks

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The lithospheric mantle beneath the North China Craton (NCC) changed dramatically in their geophysical and geochemical characteristics from the Paleozoic to the Cenozoic. This study uses samples of Mesozoic basalts and mafic intrusions from the NCC to investigate the nature of its mantle in the Mesozoic. Sr-Nd-Pb isotopic data demonstrate that the Mesozoic lithospheric mantle was extremely heterogeneous. In the central craton, it was slightly Sr-Nd enriched; beneath the Taihangshan region it had an EM1 character ($^{87}Sr/^{86}Sr_i$ = 0.7050~0.7066; $\varepsilon_{Nd(t)}$ = -17~-10); and beneath the Luxi-Jiaodong region it possessed an EM2-like characteristics ($^{87}Sr/^{86}Sr_i$ up to 0.7114). Compositional variation with time was also apparent in the Mesozoic lithospheric mantle. Our data suggest that the old lithospheric mantle was modified in the Mesozoic by a silicic melt, where beneath the Luxi-Jiaodong region it was severely modified, but in the central and Taihangshan regions the effects were much less. The silicic melt may be product of partial melting of crustal materials brought into the mantle by the subducted slab during the formation of circum-cratonic orogenic belts. This Mesozoic mantle did not survive for a long time, it was in turn replaced by a Cenozoic mantle with a depleted geochemical feature.

References

Zhang H.-F., Sun M., Zhou X. H., Fan W. M., Zhai M. G., and Yin J. F., (2002), *Contrib. Mineral. Petrol.* 144, 241-253.

Zhang H.-F. and Sun M., (2002), *Int. Geol. Rev.* 44, 370-382.