

Nano-heterogeneity of natural and synthetic silica-rich glasses: microscopic and spectroscopic study

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In geological environment extreme PT-conditions result in glass-like solids, the study of which allows specifying structural and chemical features of extreme materials with a great application potential for technology. We studied nanostructure of natural glasses, including HPHT impactites and tektites, UHPHT impact glasses, compared to LPHT volcanic and technogenic glasses and synthetic silica glass. We presented complex data by AFM, EDS/SEM/HRTEM, XRD, IR and Raman spectroscopy. We showed the dependence of surface nano-heterogeneity on the saturation of their structure by cation modifiers (Al, Mg, Na, Ca). We observed the strongest effect due to the presence of Na impurities. For relatively pure SiO₂ glasses the degree of structural order determined according to Raman spectroscopy is correlated with the impurity concentrations. The pure SiO₂ glasses have the smallest sizes of nanostructural elements. We will discuss the discrepancy between the results of X-ray and spectroscopy in assessing the degree of order of the glasses.

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