

## **Tectonophysical aspect of geodynamic mode of formation of alkaline rocks of the Priazovie**

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Surveying was conducted within the Priazovie megablock of the Ukrainian crystalline shield. Deformations of igneous and ultrametamorphic formations near the Oktyabrsky alkaline massif and the Priazovie megablock as a whole were studied (Alyokhin, 2006; Alyokhin, Gintov, 2004).

To research into stress and deformation fields of the earlier stages of the earth's crust evolution in conditions of large depths a method of structural paragenic analysis proposed by O. B. Gintov (Gintov, 2005) was used. This method is based on investigation and detailed mapping of paragenesis of deformation structures: L-shears, R-shears, R'-shears; T-structures (structures of relative tension), S-structures (drag fold hinges) and others. Analysis of ratios of these structures allows us to determine position in space of the axes of the main normal stresses, morphokinematic type of faults, including those that control massifs and bodies of alkaline rocks. This technique related to the analysis of shear turns and other deformation structures makes it possible to distinguish superimposed stress fields and to determine their relative age.

To research into the brittle deformations of rocks of the Eastern Priazovie we used a method of kinematic analysis proposed by O. I. Gushchenko and V. A. Korchemagin (Gushchenko, 1979). The method is based on the analysis of directions of shear movements that arise along faults under the impact of single stress field. Fundamentally important point of the method is that reconstruction of stress field is made starting from the condition that by the beginning of the impact of stress field there were already existed differently directed faults in the volume of rock mass. The impact of stresses on rock mass leads to occurrence of displacements along the old fault structures and to new deformations. As a result of this at the gliding planes of the earlier formed faults and fractures and also at the vein and dike casings gliding furrows and grooves form. Measurement of the elements of occurrence of furrows and grooves at the gliding planes and also of the gliding planes makes it possible to make reconstruction of the old fields of total deformations and stresses. Among these fields we can distinguish also those fields in conditions of which bodies of alkaline rocks have been forming. During reconstruction of these fields we can determine position in space of the main normal stresses and type of the stressed state of rock mass. Position of the axes relative to the bodies of igneous formations and type of the stressed state of rock mass allow us to determine geodynamic conditions for formation of these bodies. These conditions can change from pure uniaxial tension and pure shear to uniaxial compression.

Tectonophysical reconstructions were made using specially developed computer programs. The programs allowed us to distinguish uneven-aged stress fields and to obtain properties of the fields of total stresses.

To determine regional features of stress fields and fields of total brittle deformations we compiled a set of special structural-tectonophysical maps for the whole of the Priazovie geoblock with the help of dedicated computer program (Alyokhin, 2006). When mapping we processed the occurrence elements of more than 21,000 deformation structures (fractures and small faults, dikes and veins, gliding planes having gliding furrows and grooves). Analysis of the constructed maps for the axes of total brittle deformations has shown that behavior of the deformation field at the area of the Oktyabrsky alkaline massif changed abruptly. These changes are well defined in the position of projection of the axes of lengthening and shortening on the horizontal plane. Near the massif north-east orientation of the lengthening axis, typical to the whole of the Priazovie block, changes for latitudinal and north-east. Near the massif, the north-east orientation of the shortening axis, which is typical to the whole of the Priazovie block, changes to latitudinal and north-west ones. The shortening axis changes its position from the sub-horizontal to the sub-vertical one. Enclosing rocks of the Oktyabrsky massif are mainly formations of the anadolsky and khlebodarovsky sequences. The obtained results show that intrusion of alkaline rocks was accompanied by brittle deformations of these sequences and took place in anomalous stress fields.

The results of the reconstruction of the old stress fields along gliding planes in nepheline syenites and in mariupolites indicate the anomalous behavior of these fields. It was determined that formation of alkaline rocks of the massif took place in conditions of predominant tension; the axis of tension occupied the sub-vertical position in space and the axis of compression oriented sub-horizontally. Such position of the axes indicates reverse fault behavior of the stress field. The obtained data agree well with the sectional position of mariupolites of the Mazurovskoe rare-metal deposit localized within the limits of the Oktyabrsky massif. Late stress fields are characterized by fault and fault-shear stress fields and also by change of tension conditions to compression conditions.

On the whole, for the Priazovie geoblock we defined confinedness of igneous rocks to areas of crossing of fault zones of different orientations. This is also true for the Oktyabrsky massif. Such areas are characterized by multistage activation of faults. To them are frequently confined concentrations of ore substance. The following features are typical for such areas: sharp increase in gliding planes and directions of displacement along them; increase in uneven-aged deformation structures; a wide age interval for formation of deformation parageneses.