



Process of conductivity in rocks

Irina Sidorova, Sergey Ushakov, and Helena Sidorova

Institute of Geology & Geophysics Uzbek Academy of Sciences, Tashkent, Uzbekistan (sidoirina@yahoo.com)

At modeling processes of transportation of heat from Earth's depths the dominating attention of researchers occupies the convection mechanism of heat transfer. At the same time the conduction plays not less important role and is more complex phenomenon for understanding, because the rocks, through which there is transferred the heat, are complex multicomponent natural ensembles.

In this connection in laboratory of Regional and Applied geophysics of Institute of Geology and Geophysics of the Academy of Sciences of Uzbekistan the computer program «PercolationCheck» (the patent №DGU 01170), intended for calculation of percolation (conductivity) process in rocks on the basis of raster pictures of distribution of elements in the sample, received on microanalyzer JXA-8800R JEOL has been developed. The scope of the program - research of materials - chemistry, physics of natural combinations. The program determines presence cells of percolation configurations and visually displays on the screen of computer the available in the investigated sample the clusters, their capacity, presence of one or more connecting clusters, testifying about presence's percolation (conductivity). To development preceded long-term (more than 20 years) laboratory studying of thermophysical properties of rocks. For this period data about heat conductivity, thermal capacities from superdeep Muruntau borehole SG-10, and also by ore deposits and the areas of the Western Uzbekistan adjoining to them are in details studied and generalized. The research problem of thermophysical anomalies in rocks were solved in four stages: (i) thermophysical experiments on hardware complex ITEM-1, I-λ-400 and I-400; (ii) the mineralogical analysis of samples on microanalyzer JXA-8800R JEOL; (iii) development of physical and mathematical model of heat conductivity of rocks; (iv) revealing of anomalous geobjects on the basis of application of algorithm of the program «Percolationcheck» on experimental data. As a result of investigations of the first stage (i) have been revealed anomalous (on heat-conducting properties) groups of rocks from collection by SG-10. Samples investigated by us macroscopic were identical, however at detailed studying at the second stage (ii) was elucidated, that in different samples distribution of components on volume absolutely variously. Researches on the allocated ensembles at (iii) stage were spent on polished sections on microanalyzer JEOL JXA - 8800R, time of the analysis of the chemical compound of separate mineral phases on EDS Link ISIS-300 (Oxford, the Great Britain) made from 1 till 5 minutes. As a result of the lead experiments on (iv) stage a generalizing stage basic elements which distribution in the sample essentially influences conductivity of heat are allocated. From the physical point of view they form in samples infinite clusters is fixed by the program «Percolationcheck», based on next working modules: (1) module «Geodata» provides input of the raster information; (2) in module «Calibration» there is an allocation of ranges; (3) in module «luster» are allocated conducting clusters; (4) module «Stat» conduct statistical processing; (5) module «Result» classifies samples on conductivity properties.