Abstract

Influence of different rock structure aspects (grain size of mineral grains, contribution of individual microstructures, role of original magmatic and/or metamorphic microstructure and brittle structure of rock massif) on pore space geometry evolution was studied. Eclogite, granite and metagabbro rock samples were examined to see different microstructural rock characteristics. Combination of quantitative microstructural analysis of grains, grain boundaries and microcrack network, measurement of lattice preferred orientation and measurements of elastic velocities at increasing confining pressure turned out to be effective in evaluation of preferred orientation of the pore space in rock samples. Together with information about porosity and permeability these analysis represents solid methodology for determination of zones of potentially high risk of fluid infiltration to the rock mass.

In studied eclogites the microporosity is related to cracks at grain boundaries and cleavage cracks ((110) planes) in clinopyroxene. With increasing confining pressure, grain boundaries close below 50 MPa, while cleavage planes in clinopyroxene remain open up to 100 MPa.

In Melechov granites the pore space geometry reflects the orientation of exfoliation planes or the pore space is preferentially oriented 20° to 40° oblique to the closest macrofracture. Microcrack preferred orientation is in agreement with pore space geometry deduced from distribution of P-wave velocity differences. The most important crack type in terms of fabric strength and interconnectivity is intergranular crack. The pore space in granites formed by planar microcracks does not reflect the observed geometry of macroscopic fractures in the Melechov massif. More likely is the explanation that microcracks forming preferred orientation developed in process zone of closest macrofarcture during its propagation and/or reactivation.

In metagabbro rocks the pore space geometry generally reflects the microstructure. The micropores follow grain boundaries and cleavage planes of amphibole mainly. The study indicate that even above confining pressure of 200 MPa the microcrack pore space in metagabbro remains open to some extend.