

The Nature and Models of Metamorphism

This book presents the genetic connections of metamorphism and geodynamics. It discusses the tectonic and magmatic processes as the reason of metamorphism, and the geological types of metamorphism, which define the features of P-T parameters and P-T-t paths. Three categories of metamorphism are distinguished depending on the heat flow rate: 1) at a geothermal gradient near to an average terrestrial ("normal") value; 2) at a heightened thermal gradient as the result of additional heat supply in the earth's crust by magmatic intrusions and diapirism of magma; 3) at a reduced thermal gradient during the collision of lithosphere plates and blocks of the earth's crust. The quantitative methods of description of metamorphism have been widely used in this book. The mathematical models of metamorphism have been studied in connection with magmatic intrusions, rifting process and magmatic diapirism. Mineral changes in the rocks controlled by variations of P-T of parameters, mass transfer and chemical reactions have also been characterized. The book proposes a quasi-stationary model of diffusion metasomatism with respect to the formation of zonal structures of minerals. The method of mineral thermobarometry for the conditions of unsteady equilibrium has been worked out; the quantitative analysis of mass transfer during metamorphic reactions in the rock matrix has been carried out, and the mobility of chemical elements at metamorphism has been estimated as well.

The book is intended for specialists in the fields of petrology, mineralogy and geochemistry, and for students at the senior and graduate level.

Earth Sciences

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