

THE P-T EVOLUTION AND FLUID COMPOSITION OF THE ARCHEAN AND PROTEROZOIC GRANULITE COMPLEXES

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Granulites can be formed under wide range of T (750—950 °C) and P (5 — 12 kb) conditions as thermodynamic calculations of main rock-forming mineral equilibria and mineral thermo-barometry data indicate. According to these estimations the intermediate high gradient (35°/ km) had been established early in the history of the granulitegneiss areas (the Akilian association, Greenland, The Enderby Land complex, Antarctica; The Kurulta complex, East Siberia), which had been rising during late periods of evolution of these structures up to 40 — 42°/ km. Within the high pressure granulite belts the geothermal gradient is appreciably smaller (25 — 30°/km) and it reduces in the geological time down to 20°/ km. Such belts originate in the late Archean (3.1 — 2.7 b.y., South India, South Africa, Enderby Land, East Siberia), in the Early Proterozoic (2.6 — 1.9 b.y., The Lapland Belt of the Baltic Shield, some belts of Australia) in the Rhenish (about 1.0 b.y. The Grenville Belt) and in the Vend (0.6 — 0.5 b.y.), and their formation is predetermined by the magmatic accretion of the crust in the early stages of evolution and by the tendency to sinking during late periods that were the cause of the low-grade metamorphism.

The investigation of fluid and melt inclusions makes it possible to appreciate more exactly the conditions of metamorphism, migmatization and charnockitization and to do so same conclusion on fluid composition of granulite facies.

The CO₂ containing fluid inclusions of extremely high density, which correspond to the maximum pressure of metamorphic events, are preserved rather rarely, that is the result of quick isothermal decompression at the initial stages of uplift. Nevertheless maximum P_{fl} estimates are concordant rather well to the data, obtained with calculation of mineral equilibria. The inclusion estimations and physico-chemical modelling indicate that H₂O activity does not exceed 0.4 for granulite facies metamorphism and the fluid is dominantly CO₂ rich. Under the conditions approximate to the granitic solidus the fluid separation took place on nearly pure CO₂ and water solution of mainly Ca, Na and K chlorides. Oxygen fugacity varies between CCO and QFM buffers and when it decreases the excess carbon is emerged as graphite.