

Mineral chemistry, pressure-temperature determination and fluids activities in Boroujerd migmatites using cordierite mineral

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Abstract: The intrusion of Boroujerd Granitoid Complex into the metamorphosed pelitic rocks has resulted in the formation of pelitic hornfels and anatectic migmatites in its metamorphic aureole. The effective melting reactions include fluid-present and fluid-absent. Fluid-present melting reactions may have consumed the whole free fluid in the aureole as a result of which melting process continued through fluid-absent reactions. It is highly probable that high-grade mineral assemblages like spinel+corundum in the aureole have formed by biotite dehydration reactions. As a result, the presence of spinel and corundum minerals in these rocks is related to the fluid-absent partial melting. Using thermodynamic equilibrium of minerals and multiple equilibrium reactions, peak pressure and temperature of metamorphism are estimated as 4 kbar and 750 °C respectively. The total fluid activity in melanosome cordierites (a CO₂ [0.15] + a H₂O [0.6]) is 0.75 at the aforementioned pressure and temperature. Melt-water content in Boroujerd migmatites is 3.75 % and H₂O content of cordierite in melanosomes is 1.1 %. Considering these numbers, the D_w of melt reactions at 750 °C for Boroujerd migmatites is 3.41 % that correlates with biotite dehydration reactions. The H₂O content of melts matches the minimum water line which is representative of fluid-absent conditions and confirms the correctness of petrographical studies, fluid-absent reactions and the estimated D_w in migmatites.

Key words: *Cordierite; fluid activities; migmatites; Boroujerd.*

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