

Time scale for formation of diffusion zoning in response to breakdown reaction

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In high-grade metamorphic rocks, garnet commonly represents an increase in Mn or Fe toward margin. This feature has been interpreted as diffusion zoning owing to garnet-consuming reactions during retrograde metamorphism. In this process, the zoned thickness can be described in terms of distances of internal diffusion and surface retreating. This study preliminarily formulated to express these distances as a function of time and retreating velocity of the surface. Applying the formulation to some high-temperature metamorphic belts yielded that the diffusion zoning with zoned thickness of 0.04 to 0.1 mm was formed by 1 to several million years. This result may be applied to estimate cooling rate provided that the surface equilibrium was maintained during the formation of diffusion zoning.

Keywords: diffusion zoning, duration time, cooling rate