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Anisotropic Fe-Mg diffusion in biotite

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ABSTRACT

Marked variations of biotite Fe-Mg compositional profiles on approach to interfaces with garnet as a function of biotite crystallographic orientation are found in a natural high-temperature metamorphic rock. For biotite with (001) planes nearly parallel to the interface, Mg increases and Fe decreases steeply toward the interface. If oblique, the profile is less steep, and if nearly perpendicular, the profile is flat. These variations are evidences for anisotropic Fe-Mg intradiffusion within biotite during cooling. For precise application of geothermobarometry and geospeedometry, the crystallographic orientation and compositional gradient in biotite must be considered.