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The size distribution of exsolution lamellae in iron-free clinopyroxene

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ABSTRACT

The size distribution of pigeonite and diopside exsolution lamellae on “001,” obtained at temperatures of 1100, 1200, and 1300 °C and annealing times between 2 and 4320 h, was studied by transmission electron microscopy. A total of 5192 pigeonite and 5286 diopside lamellae was studied. At all three temperatures, the size distributions of pigeonite and diopside lamellae are smaller during exsolution compared to the subsequent coarsening process. The final size distributions are time invariant, indicating that a steady-stage distribution is reached. The theory of Ardell (1972a), which assumes volume diffusion as rate-limiting process and takes into account the non-zero volume fraction of the precipitates, describes the experimental size distributions quite well and also leads to the observed exponent of three in the rate law.

Keywords: exsolution, clinopyroxene, size distribution, exsolution lamella, electron microscopy, experimental petrology, kinetics