

Grain growth in sintered polycrystalline diopside

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Grain growth kinetics were studied in sintered polycrystalline diopside. The starting material was prepared from two types of diopside single crystals (I :Ca_{0.99}Na_{0.01}Mg_{0.97}Fe_{0.03}Si₂O₆, II :Ca_{0.97}Na_{0.02}Mg_{0.86}Fe_{0.13}Si₂O₆). They were crushed and milled to particle size of <math><1\mu\text{m}</math>. The powders were pressed into cylindrical shape under a uni-axial pressure of 2.0 MPa for 10 minutes. The pellets were then sintered at 1130 - 1280 °C for 2h and 6h. As a result, grain size increased and the porosity decreased with increasing sintering temperature or sintering time. The experimental data can be fit the following relation, $D_f^n - D_0^n = kt$ where n is a constant, D_f and D_0 are the grain size at time $t = t$ and $t = 0$ respectively, and k is a rate constant. For the sintered polycrystalline diopside, the parameter $\log_{10}k$ ($\mu\text{m}^n/\text{s}$) was determined to be -3.3 or -4.8 for $n = 2.59$ or 2.64 respectively.

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