

Synthesis of fine-grained and high density forsterite.

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We can consider a rock as a polycrystalline aggregate, which is composed of crystal interface and crystal lattice. Thus, physical property of the rock is the sum of the property of crystal interface and crystal lattice. A goal of this study is to obtain fine-grained and high density forsterite aggregate, which is well-suited to study the property of crystal interface.

The volume of interface in polycrystalline aggregate with grain size of 100nm is 10^{-4} times larger than the volume of interface in the aggregate with grain size of 1mm. Therefore, it is expected that we can know the interface properties from measuring the bulk properties of fine-grained materials. We synthesized forsterite aggregates from following procedures: 1) mixing starting materials of SiO_2 and $\text{Mg}(\text{OH})_2$ nano-powders, 2) dehydration and chemical reaction at 800-1000 degree, 3) making green compact at 200MPa, and 4) sintering at 1400 degree under vacuum or O_2 . As a result, we have succesfully obtained fine-grained and high density forsterite aggregate.