

The 411th Geodynamics Seminar

Making transparent nano-polycrystalline ceramics with Kawai-type multi-anvil apparatus

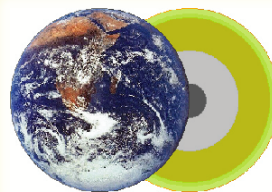
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Abstract

Transparent polycrystalline oxides are important for various scientific and industrial applications, which have been synthesized by high-temperature sintering techniques, such as HIP or SPS, under relatively low pressures (<1 GPa). However, the minimum grain sizes of such transparent ceramics are generally larger than 1 micrometers, although it is expected that the optical transparency and mechanical strength are both significantly enhanced if those ceramics made of pure nano-crystals (<100 nm) are available. We used Kawai-type multi-anvil apparatus to synthesize some polycrystalline silicate garnets using glass starting materials with minimal water absorption, and found that well-sintered polycrystalline garnets with grain sizes ~ 50 nm are produced at the modest temperatures of 1300-1400C at high pressure. Thus synthesized nano-polycrystalline garnets are highly transparent, whose grain sizes are tunable by changing the synthesis temperature and pressure. The present direct conversion method at very high pressure and temperature opens a new pathway to synthesize fully crystallized transparent nano-polycrystalline ceramics.

詳細は当センターホームページ: <http://www.ehime-u.ac.jp/~grc/>をご覧ください

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