# The 425th Geodynamics Seminar

## Synthesis of nano-polycrystalline grossular garnet under high pressure and high temperature

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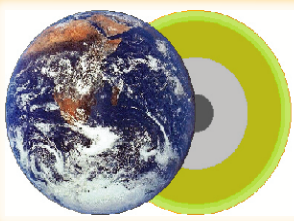
**Venu: Meeting Room #486, Science Research Bldg 1, Ehime Univ.**

**日時：2015年10月9日(金)16:30～**
**場所：愛媛大学 総合研究棟Ⅰ 4階共通会議室**



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**Abstract**

Garnet is one of the most abundant minerals in the Earth's upper mantle and the transition zone. Synthesis of well-sintered polycrystalline garnet is important for measurements of sound velocities by ultrasonic method. However, synthesis of high-quality polycrystalline garnet was difficult until a recent study on almandine by Arimoto et al. (in prep), where well-sintered polycrystalline almandine samples with grain sizes of 2-3 μm were successfully made. In this study, synthesis experiments for grossular ($Ca_3Al_2Si_3O_{12}$) have been conducted at pressures of 5-15 GPa and at various temperatures in a multianvil apparatus (ORANGE-3000). I used glass rods with a grossular composition as the starting material. In order to avoid the formation of cracks in the grossular sample, a heating procedure was adopted during pressure releasing. Well-sintered polycrystalline garnets with grain sizes of 50-100 nm were produced at the modest temperatures of 1300-1400 ℃ at 15 GPa. It is confirmed that grain growth of up to 200 nm happened at 1600 ℃. Grain growth was also observed at around 1200 ℃, just above the crystallization temperature from glass, where crystals with about several μm in grain-size was observed. The sample obtained at 1200 ℃ was opaque and milky white in color, while those obtained at 1300-1500 ℃ showed high transparency. The sample obtained at 1600 ℃ was also transparent, but was dark brown in color. The successful synthesis of high-quality nano-polycrystalline grossular is considered to be due to the absence of water in the starting material. Thus synthesized nano-polycrystalline garnets are highly transparent, whose grain sizes are tunable by changing the synthesis temperature and pressure.

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