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Point defect observation in crystallization by heating amorphous silicate with forsterite composition

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Point defects in silicate material with forsterite composition have been investigated by electron spin resonance (ESR). Amorphous silicate with forsterite composition was prepared and annealed at certain temperatures up to 1500°C. ESR signals were measured at room temperature after gamma-irradiation using ⁶⁰Co. The amorphous sample (starting material) has broad signals and the crystalline sample annealed at 1500°C shows weak and sharp signals. ESR spectra change gradually with an increase of heating temperature. The broad signals become narrow and weak in the region up to 400°C and new signals appear after 500°C and 700°C. Those new signals are different in comparison with the sample heated at 1500°C. It suggests that crystallization from amorphous silicate with forsterite composition may have a few steps to crystal.

Keywords: forsterite, point defect, electron spin resonance (ESR), amorphous, crystallization, x-ray diffraction (XRD)