

GROWTH AND CHARACTERIZATION OF PEROVSKITE LaGaO₃: SrMnO₃ SOLID SOLUTION CRYSTALS

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Experiments on growth of perovskite La_{1-x}Sr_xGa_{1-x}Mn_xO₃ (with $x=0.02$, 0.05 and 0.065) solid solution crystals by the Czochralski method from iridium 40mm crucible with 2mm/h growth rate and speed of rotation 20 rpm are reported. Strong reduction of the melt and spiral deformation of growing crystal increasing with x was observed.

Structure analysis of obtained crystals was performed by X-Ray powder diffraction using Ni-filtered Cu K α radiation with a Siemens D5000 diffractometer. Data were collected in the angle range $20^\circ < 2\theta < 160^\circ$ with a step $0,02^\circ$ and averaging time of 10s/step. The diffraction patterns were analyzed by the Rietveld refinement method. XRD measurements showed Pbnm orthorhombic structure of La_{1-x}Sr_xGa_{1-x}Mn_xO₃ (with $x=0.02$ and 0.05) at room temperature.

The polarized Raman spectra were measured in backscattering geometry using InVia Renishaw spectrometer equipped with optical microscope. The spectra were recorded in spectral range $100 - 1100 \text{ cm}^{-1}$ with resolution better than 2 cm^{-1} . The laser power of 488 nm wavelength, before focusing with 50 \times LWD objective, was less than 6 mW. The temperature investigations on crystal with $x=0.065$ were performed using Linkam THMS 600 cooling/heating stage in temperature range below phase transition temperature up to 55°C with 0.3°C step. First order phase transition near room temperature and some anomaly of Raman band parameters at about 47°C were observed.

Characterization of obtained crystals by DSC showed that temperature of first order phase transition from orthorhombic Pbnm to rhombohedral R-3c structure decreases with $20,5^\circ\text{C}/1\text{mol}\%$ SrMnO₃ down to about 20°C for $x=0.065$.

References:

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