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ABSTRACT

Piezoelectric crystals $Ca_3Nb(Al_{0.5}Ga_{0.5})_3Si_2O_{14}$ (CNAGS) with langasite structure have been successfully grown by Czochralski method. In this work, the crystal structure, quality, chemical composition, piezoelectric properties, electric resistivity and optical properties of the as-grown crystals were characterized. The full width at half-maximum (FWHM) of the rocking curve of CNAGS was found to be 23″ . The chemical compositions of CNAGS crystals are very close to that of initial compositions. At room temperature, the piezoelectric coefficients d_{11} and d_{14} of CNAGS crystals are 4.12 *pC/N* and -5.03 *pC/N*, and the electromechanical coupling coefficients k_{12} and k_{26} are also determined as 11.6% and 18.3%, respectively. The electric resistivity of as-growth crystal was found to be on the order of 2×10^8 Ω·cm at 500 ºC and 1×10^6 Ω·cm at 800 ºC. And the transmittances of CNAGS crystals were found to be over 80% in the wavelength range of 700-2700 nm.

Keywords:

A1. Crystal structure; A1. X-ray diffraction; A2. Czochralski method; B1. Gallium compounds; B2. Piezoelectric materials

1. Introduction