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Effect of Aluminum Content on Lattice Parameters and Unit Cell Volume in Bulk Crystals β-$(Al_xGa_{1-x})_2O_3$

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Abstract. The article studies the influence of aluminum on the lattice parameters and the unit cell volume of the binary solid solution β-$(Al_xGa_{1-x})_2O_3$. The aluminum content is determined by energy-dispersive X-ray spectroscopy. The lattice parameter values are calculated using X-ray diffractometry data. The diffraction patterns show peak broadening and shift to higher angles with increasing aluminum content. It is shown that when the aluminum fraction x changes from 0 to 0.25, the lattice parameters decrease linearly. This is consistent with Vegard's law for solid solutions. The decrease in cell volume is physically related to the fact that aluminum has a smaller ionic radius than gallium, and the Al–O bond length is shorter than Ga–O one.

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