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Magnetic properties of $GaFeO_3$ prepared by slow cooling and quenched heat treatment method

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Abstract

The ferrimagnetic and piezoelectric materials $GaFeO_3$ were prepared by slow cooling and quenching method, and studied by X-ray diffraction, neutron diffraction and Mössbauer spectroscopy. The crystal structures of samples were found to be orthorhombic with the lattice constants of the slowly cooled sample $a = 8.7457$, $b = 9.3921$, and $c = 5.0816$ Å, and those of the quenched sample $a = 8.7462$, $b = 9.3896$, and $c = 5.0809$ Å. The different behaviours of magnetic structure between two samples appeared by Mössbauer measurement. For the quenched sample, Néel temperature was 210 K, while it increased to 260 K for the slowly cooled sample. The decrease of magnetic transition temperature originates from distributions of magnetic Fe ion at four cation sites and the strength of exchange interaction between magnetic ions.

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