

# Magnetic Properties on Ferromagnetic $\text{FeAlO}_3$

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$\text{FeAlO}_3$  polycrystalline sample was fabricated by the sol-gel method. The crystallographic and magnetic properties of the sample were measured using X-ray diffractometer, Mössbauer spectroscopy, and vibrating sample magnetometer (VSM). The crystal structure was found to be an orthorhombic with the space group  $Pna2_1$ , which has four cation sites labeled Fe1, Fe2, Al2(octahedral sites), and Al1(tetrahedral site). Magnetic hysteresis curves of  $\text{FeAlO}_3$  showed the ferromagnetic phase and a pinched-like shape at low temperature, which is similar to those of 'exchange-spring magnet'. The Curie temperature was determined to be 250 K. Mössbauer spectra were measured from 4.2 to 295 K. The isomer shifts at room temperature are 0.32 mm/s and 0.11 mm/s relative to  $\alpha$ -Fe metal, which is consistent with ferric state in oxide materials. Mössbauer spectra showed line broadening and the changes in linewidth with increasing temperature, we have examined the cation distribution and anisotropy energy difference of Fe1, Fe2, Al2, and Al1 sites. From the analysis of Mössbauer spectrum at 4.2 K, the occupancies of Fe ion on Fe1, Fe2, Al1, and Al2 sites are determined to be 41.15%, 38.7%, 7.8%, and 12.4%, respectively.

*Index Terms*—Exchange-spring, Mössbauer spectroscopy, reciprocal susceptibility, sol-gel method.