

Magnetostriction of AlFe_2B_2 in High Magnetic Fields

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Abstract:

We present an extensive investigation on the magnetostriction of polycrystalline AlFe_2B_2 , using the experimental capability of the novel X-ray diffraction instrument available at 25 Tesla Florida Split Coil Magnet at the NHMFL. The magnetostriction has been measured near the ferromagnetic transition, at 250, 290, and 300 K. AlFe_2B_2 exhibits an anisotropic change in lattice parameters as a function of magnetic field near the Curie temperature ($T_C = 285$ K). A monotonic but anisotropic variation in lattice parameters as a function of applied field has been observed, i.e. the c parameter increases significantly while the a and b parameters decrease with the increasing field in the vicinity of T_C , irrespective of the measurement temperature. The volume magnetostriction changes sign across T_C and decreases with decreasing temperature. The origin of the observed magnetocrystalline anisotropy is explained on the basis of spin-lattice coupling and the magnetic anisotropies.