Structural and Magnetic Properties of $FeTiTaO_6$

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We have investigated the structural and magnetic properties of $FeTiTaO_6$. From the Rietveld-refined XRD patterns of $FeTiTaO_6$, its crystal structure at room temperature is determined to be the rutile structure with lattice constants of $a_0 = 4.65$ Å, and $c_0 = 3.02$ Å. The c/a ratio of 0.649 is almost same as the value in the parent rutile TiO_2, which is 0.644. Based on the temperature dependence of the susceptibility between 3 and 400 K, measured with superconducting quantum interference device (SQUID), the magnetic Néel temperature (T_N), which is defined as temperature of the maximum slope in dM/dT, is determined to be 40 K. The detailed studies of the local structure have been carried out with ^{57}Co Mössbauer spectroscopy at various temperatures. The Mössbauer spectra of $FeTiTaO_6$ were composed of two six-line hyperfine patterns below 40 K. Also, the magnetic hyperfine field of $FeTiTaO_6$ is found to be 472 kOe at 4.2 K. The Mössbauer spectra clearly reveal the presence of the magnetic ordering below 40 K in $FeTiTaO_6$.

Index Terms—**Antiferromagnetic, $FeTiTaO_6$, Jahn-Teller distortion, Mössbauer spectroscopy.**