

MÖSSBAUER STUDY AND MACROSCOPIC/GLOBAL MAGNETIC BEHAVIOUR OF POWDERED ILMENITE (FeTiO₃) SAMPLE

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Ilmenite (FeTiO₃) is an interesting material for its magnetic properties particularly in a ilmenite-hematite solid solution, in which it governs magnetic behaviour of hematite causing hematite to be canted with strong magnetic response. In solution with hematite ilmenite behaves as a magnetically hard phase and it induces exchange bias phenomenon in the solid solution. In addition, ilmenite-hematite solid solutions exhibit a strong and time stable remanent magnetization and that is why they are now used as a model system for explanation of crustal magnetism of soils and rocks on Mars.

For better understanding of role of ilmenite in the ilmenite-hematite system, we re-examined the Mössbauer spectra and macroscopic magnetic properties of ilmenite in the form of a commercial powdered sample of FeTiO₃. We measured the Mössbauer spectra of ilmenite in the paramagnetic regime from 57 K to 300 K and in a magnetically ordered state below 57 K. Macroscopic magnetic measurements were carried out by an MPMS XL-7 magnetometer to determine a temperature dependence of the magnetization and hysteresis loops of this sample. We show how to correctly fit the Mössbauer spectra below 57 K both spectra and magnetization measurements confirm the below ordering temperature of ilmenite it behaves as canted antiferromagnetic material with significant magnetic hardening at low temperatures.

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