

Mössbauer Studies of Fe^{2+} in Iron Langbeinites and other Crystals with Langbeinite Structure

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^{57}Fe Mössbauer spectra have been measured at various temperatures between 4.2 K and 300 K for iron langbeinites $\text{A}_2\text{Fe}_2(\text{SO}_4)_3$ with $\text{A} = \text{K}, \text{NH}_4, \text{Rb}, \text{Tl}$ and magnesium, manganese and cadmium langbeinites doped with Fe^{2+} . The spectra revealed several contributions whose isomer shifts and quadrupole splittings have been obtained by fitting program routines. For the high-temperature cubic phases two crystallographically non-equivalent iron sites have been identified, characteristic of Fe^{2+} in the high-spin state. Abrupt changes of the quadrupole couplings indicated phase transitions; in some cases, the spectra have also revealed several sites for Fe^{2+} in low temperature phases. From the temperature dependences, phase transition temperatures, crystal field splittings and Debye temperatures have been derived.

Key words: ^{57}Fe Mössbauer Spectroscopy; Inorganic Crystals; Structure; Phase Transitions.

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