

MÖSSBAUER SPECTRA OF SrEuFeO_4

D.Hanžel

J. Stefan Institute, University of Ljubljana, Yugoslavia

We report here the features of Mössbauer spectra of ^{57}Fe in ferrite SrEuFeO_4 .

The crystallographic structure ⁽¹⁾ of SrEuFeO_4 is tetragonal belonging to the space group $I4/mmm$ having lattice constant $a = 3,841 \text{ \AA}$ and $c = 12,471 \text{ \AA}$. The point symmetry of iron in 2a site is $4 mmm$, Sr and Eu ions are statistically distributed over the same site, 2a.

The Mössbauer spectra of ^{57}Fe were determined at various temperatures with the constant acceleration spectrometer using enriched powdered absorber of SrEuFeO_4 and source of ^{57}Co in Pd. Calibration was based on the Mössbauer spectra of iron foils.

Fig. 1 shows typical Mössbauer spectra of ^{57}Fe in SrEuFeO_4 for the temperature range 77 to 300 K. Well resolved six line pattern indicate that all iron ions are in equivalent sites in agreement with crystallographic results ⁽¹⁾. The spectra below T_N are characteristic for combined electric and magnetic hyperfine interaction. At 77 K the spectrum yields the internal magnetic field $495 \pm 10 \text{ KG}$, isomer shift relative to metallic iron of $0.43 \pm 0.06 \text{ mm/s}$ and quadrupole splitting of $0.49 \pm 0.06 \text{ mm/s}$. The magnetic hyperfine field decreased with increasing temperature up to $278 \pm 5 \text{ K}$ which is assigned as Neel temperature. In the temperature range close to T_N the spectra broaden to a distorted six line pattern with stronger central peaks. Such spectra may be explained with critical superparamagnetism ⁽²⁾. Above Neel temperature the spectrum consisted of two absorption lines due to the interaction between the electric quadrupole moment of iron nucleus and the electric field gradient tensor at the iron. The values for isomer shift and quadrupole splitting yield at 300 K: $0.31 \pm 0.06 \text{ mm/s}$ and $0.98 \pm 0.04 \text{ mm/s}$.

Acknowledgement: Thanks to Dr. M.Drofenik for the sample preparation and X ray analysis.

References

1. J.C.Joubert, A.Colomb, D.Elmaleh, G. Le Flem, A.Daoudi and G. Ollivier: J. of Sol. St. Ch. 2, 343, 1970.
2. L.M.Levinson, M.Luban and S.Shtrikman: Phys. Rev. 177, 864, 1968.

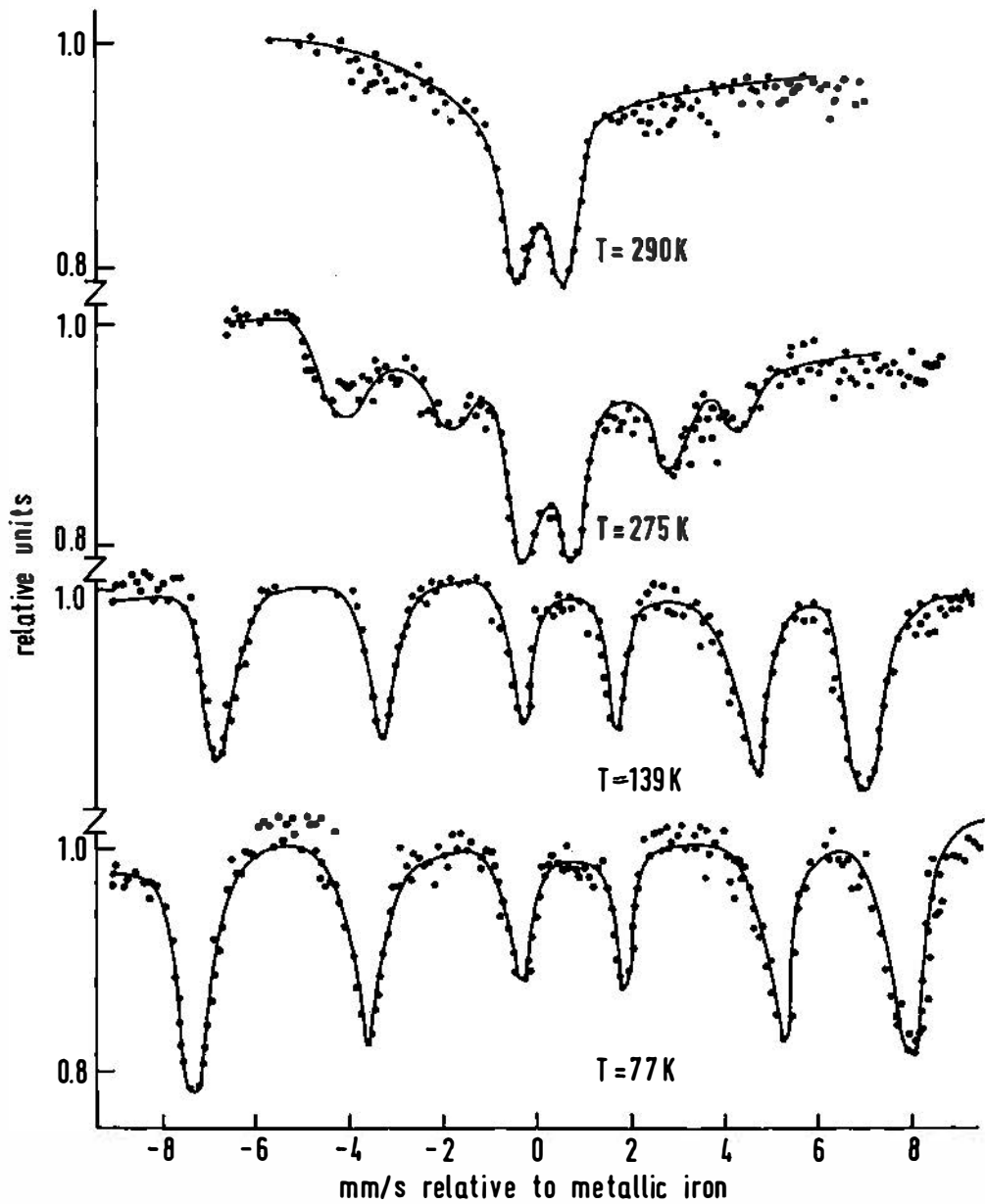


Fig. 1 Mössbauer spectra of ^{57}Fe in SrEuFeO_4 with ^{57}Co in Pd.