08.5–2 MAGNETIC ORDERING OF THE RARE EARTH INTERMETALLIC COMPOUND $ErCu_2$. By B.Lebech, Physics Department, Risø National Laboratory, Roskilde, Denmark, Z.Smetana and V.Sima, Department of Metal Physics, Charles University, 12116 Prague, Czechoslovakia.

The intermetallic compound $ErCu_2$ exhibits unusual magnetic properties which may be explained by the competition of large magnetocrystalline and exchange anisotropies similar to those found in other rare earth intermetallics. $ErCu_2$ crystallizes in the $CeCu_2$ orthorhombic structure (Imma) with the rare earth atoms at the 4e positions and the Cu atoms at the 8h positions. $ErCu_2$ orders magnetically at 11.8K. Further, the temperature dependence of the ac-susceptibility and electrical resistivity revealed anomalies at T_1=6.1K and T_2=4.3K. For a better understanding of the magnetic structure of $ErCu_2$, powder neutron diffraction studies have been performed between 1.6 and 15K, and at room temperature in zero applied magnetic field. These studies revealed an incommensurate antiferromagnetic structure below 11.8 K with the propagation vector presumeably along the b-axis of the orthorhombic crystal structure. Near both T_1 and T_2 the diffraction patterns show changes of the magnetic structure at 6.3K which probably connected to changes of the modulation wave vector. The data will be analysed by means of powder profile analysis. Attempts will be made to correlate the resulting models of the magnetic structure to the results of macroscopic magnetic measurements.

08.5–3 THE LOW TEMPERATURE MAGNETIC STRUCTURE OF HEXAGONAL FeGe. By B. Lebech, Physics Department., Risø National Laboratory, Roskilde, Denmark, J. Bernhard and O. Beckman, Institute of Technology, University of Uppsala, Uppsala, Sweden.

Iron monogermanide, FeGe, is known to exist in three polymorphs with monoclinic, hexagonal and cubic structures, respectively (Richardson, M. (1967). Acta Chem. Scand. 21, 2305). Hexagonal FeGe has the B-35 type structure (P6/mmm) and is antiferromagnetic below T_N = 410 K with the spins parallel to the c-axis. Earlier susceptibility, pulsed field (Beckman, Carrander, Lundgren and Richardson (1972) Physica Scripta 6, 151), magneto-resistance (Stenström and Sundström (1972) Physica Scripta 6, 164) and neutron diffraction measurements (Forsyth, Wilkinson and Gardner (1978) J. Phys. F8, 2195) indicate that the spins tilt away from the c-axis below ~30 K and form an antiferromagnetic cone structure. Below 30 K several field induced spin rearrangements have been seen by Beckman et al. and Stenström and Sundström.

Our neutron diffraction studies show that already below ~57 K the structure changes to a c-axis double cone antiferromagnetic structure with an interlayer turn angle for the basal plane moment component of 194.4° independent of temperature and applied field. This corresponds to a periodicity of ~100 Å. A reinterpretation of the above quoted data suggests that these findings are consistent with the macroscopic magnetic measurements and not inconsistent with earlier neutron diffraction data. The cone half angle increases with decreasing temperature to ~14° at 4.2 K, as can be seen in Fig. 1, but its temperature dependence shows a pronounced kink at 30 K indicating a phase change at this temperature.

At 4.2 K we observe an anomalous decrease of the basal plane moment component at a critical field of 1.4 Tesla applied perpendicular to the c-axis. With increasing temperature the critical field decreases and the anomaly becomes less pronounced. The cone structure is found to persist up to at least 3.9 T (B⊥c), which was the upper limit of the applied field used so far. Further measurements with higher fields and with fields along the c-axis are in progres.

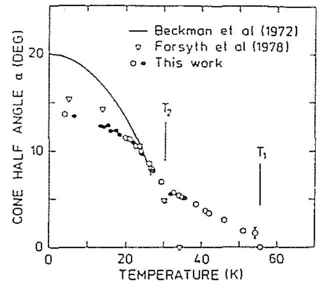

Fig. 1. Cone half angle α in FeGe (B35) calculated from experimental data assuming a double cone antiferromagnetic structure. The angle α is the angle with which the iron moments are canted away from the c-axis. Also shown are the cone half angles determined by Forsyth et al. and that calculated by Beckman et al.

08.5–4 MAGNETIZATION, MOSSBAUER AND NEUTRON STUDIES OF α- AND β-$LiMnFeF_6$. By G. Courbion*, R. De Pape*, J. Teillet**, F. Varret** and J. Pannetier*** ; *Laboratoire des Fluorures et Oxyfluorures Ioniques (ERA 609) **Laboratoire de Spectrométrie Mössbauer (ERA 682) Université du Maine 72017 Le Mans Cédex ; ***Institut Laue Langevin, 156X Centre de Tri, 38042 Grenoble Cédex.

The ternary fluoride $LiMnFeF_6$ with trigonal symmetry (Na_2SiF_6 structural type) shows a dimorphism (α → β at 560°C) due to a different cationic distribution within the P321 space group. Both phases can be described as a slightly distorded hexagonally close packed fluorine framework with cations placed in half of the octahedral sites.

The structural and magnetic properties have been studied by R.X. and neutron diffraction, Mössbauer and magnetization techniques.

For α-phase (low temperature form), magnetization, Mössbauer and neutron diffraction experiments, show an antiferromagnetic (TN = 158K) behaviour ($\vec{c}$ direction for spins) explained in terms of superexchange interactions via a corner-sharing octahedra mode.

In the β-phase (high temperature form), the three magnetic sublattices (2 Iron sites and 1 Manganèse site) lead to a ferrimagnetic behaviour (Tc = 113K). The Mössbauer experiments show that only one iron site (Fe2d) is antiferromagnetically coupled with the manganese ions below Tc. The other iron site (Fe1a) is weakly coupled to the net magnetization and behaves as an "idle" spin.

The neutron diffraction (T = 10K and T = 2K) and magnetization data corroborate the unusual behaviour of the Iron (1a). The proposed structure (spins in the c direction) is discussed with respect to the connecting mode of the MF_6 octahedra (corner + edge-sharing).