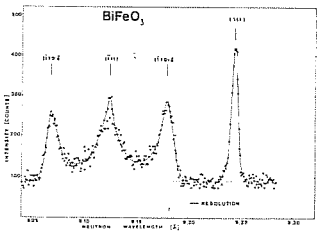
08.5-01 MAGNETIC STRUCTURE OF $BaCaFe_4O_8$: ANALYSIS OF NEUTRON DIFFRACTION MEASUREMENTS. By Y. Abbas, M. Mostfa and M. Fayek, Neutron Diffraction Group, Neutron Physics Department, Atomic Energy Establishment, Cairo, Egypt.

The compound $BaCaFe_4O_8$ crystallizes in the trigonal space group $P\bar{3}1m$ with one formula unit per unit cell and the lattice constants are a = 5.4059, c = 7.7023 Å. Neutron diffraction measurements carried out on a powder sample in the temperature range 300 - 900 K showed that the compound undergoes a magnetic transition to an antiferromagnetic state at Neel temperature T_N = (680±5) K. Analysis of the room temperature neutron diffraction pattern gave a magnetic unit cell with the same periodicity as the crystallographic one $\vec{k}$ = [000]. An antiferromagnetic model is proposed with the iron spin magnetic moments parallel to the $\vec{C}$ - axis of the unit cell. The magnetic moment value of the Fe^{3+} ions was found to be (4.5±0.1) u_B.



08.5-02 MAGNETIC NEUTRON DIFFRACTION IN BISMUTH FERRITE. By I.Sosnowska[x], E.Steichele, T. Peterlin-Neumeier, Fakultät für Physik,E 21 der Technischen Universität München, 8046 Garching, BRD and M.Szymański, Warsaw University, Poland.

The magnetic structure of $BiFeO_3$ has been widely investigated with Mössbauer and neutron diffraction technique (eg. Jacobson A., Fender B., J.Phys.C, 8, 844,(1975)). Bismuth ferrite has a slightly rhombohedrally distorted perovskite structure with $\alpha = 89^o24'$, space group R3c, and the magnetic structure of G-type. It shows both antiferromagnetic and ferroelectric ordering. As only polycrystalline material is available, only the magnetic moment direction of Fe^{+3} ions with respect to the 3-fold axis can be determined by the splitting of magnetic diffraction maxima. Such an experiment was performed at the Dubna Pulsed Reactor and the magnetic moment was found to be perpendicular to th 3-fold axis (Sosnowska I. et al. Reprint JINR, 2653, Dubna, (1964)). The coexistence of the ferroelectric and magnetic ordering in $BiFeO_3$, and the irregular form of the diffraction maxima were the reasons for further measurements with the high resolution TOF diffractometer at Garching (Steichele E., Arnold P., Phys.Lett. 44A, 165, (1973)). A part of the diffraction pattern is shown in the figure. The (111) reflection at 9.25 Å has the profile and the halfwidth of the instrumental resolution function. In addition we observe a group of three maxima centered at the expected position of the $(\bar{1}11)$ reflection at 9.12 Å. The whole pattern displayed above the Neel temperature. Measurements on another sample of different origin showed a less pronounced triplet having the same position, overall width and steep outer flanks. The intensity ratio

$$I(111)/I_{(\bar{1}11\ \text{triplet})} = 0.23 \pm 0.03$$

is the same for both samples. In the neighborhood of other magnetic reflections satellite lines are also observed. Assuming a spiral megnetic structure we obtain from the distance of the lines in the triplet an unusually long period of about 750 Å. However more experimental information has to be gained to clarify fully the magnetic structure.

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08.5-03 OBSERVATION OF HYPERFINE-ENHANCED NUCLEAR ORIENTATION BY MEANS OF NEUTRON DIFFRACTION. By M. Steiner, H. Dachs, Y. Ajiro, A.H. Millhouse, K. Ohlhoff, G. Rahn, U. Scheer, Hahn-Meitner-Institut, Glienicker Str. 100, D-1000 Berlin 39 (W-Germany).

By means of elastic neutron scattering we have observed the orientation of the ^{59}Co-nuclei in the hyperfine field of the ordered electronic magnetic moments through the term $(b^+-b^-) \neq 0$ in the structure factor. The orientation of the nuclear moments P_N gives rise to a new Bragg-peak in CoF_2 whose intensity is proportional to $P_N^2\,(b^+-b^-)^2$. At very low temperatures ($T \lesssim 20$ mK) P_N becomes large enough to produce a measurable (001) Bragg peak in CoF_2. Our results indicate that we have achieved $P_N = 0.25$ corresponding to a nuclear temperature of 14 mK. The corresponding (001)-intensity was 1% of the (002)-peak. Possible applications for crystallography of the influence of nuclear orientation on the structure factor are discussed.