08. INORGANIC AND MINERALOGICAL CRYSTALLOGRAPHY

08.5-01 MAGNETIC STRUCTURE OF BaCaFe$_4$O$_8$:
ANALYSIS OF NEUTRON DIFFRACTION MEASUREMENTS. By Y.
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lishment, Cairo, Egypt.

The compound BaCaFe$_4$O$_8$ crystallizes in the trigonal
space group $P3_1m$ with one formula unit per unit cell and
the lattice constants are $a = 5.4039$, $c = 7.7023$ 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 anti-
ferromagnetic 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 periodic-
ity as the crystallographic one $\mathbf{k} = [000]$. An anti-
ferromagnetic model is proposed with the iron spin mag-
netic moments parallel to the $\bar{c}$-axis of the unit cell.
The magnetic moment value of the Fe$^{3+}$ ions was found to
be (4.5±0.1) $\mu_B$.

Neutron diffraction and the instrumental resolution function. In addi-
tion we observe a group of three maxima centered at the expected position of the (111) re-
flexion at 9.12 Å. The whole pattern dis-

appears above the Neel temperature. Measure-
ments on another sample of different origin
showed a less pronounced triplet having the
same position, overall width and steep outer
flanks. The intensity ratio

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

is the same for both samples. In the neigh-
borhood of other magnetic reflections satel-
lite lines are also observed. Assuming a
spiral magnetic structure we obtain from the
distance of the lines in the triplet an un-
usually long period of about 750 Å. However
more experimental information has to be
gained to clarify fully the magnetic struc-
uture.

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08.5-02 MAGNETIC NEUTRON DIFFRACTION IN BIS-
MUTH FERRITE. By I. Sosnowska, E. Steichele, T.
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The magnetic structure of BiFeO$_3$, has been
widely investigated with Mössbauer and neutron
diffraction technique (eg. Jacobson A., Fender
H., J. Phys. C 11, 844, (1975)). Bismuth Ferrite
has a slightly rhombohedrally distorted perov-
skite structure with $a = 89.25$, space group
$R\overline{3}c$, 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
is 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 the 3-fold axis (Sosnowska I. et al. Re-
print JINR, 2653, Dubna, (1964)). The coex-
sistence 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 reso-


08.5-03 OBSERVATION OF HYPERFINE-ENHANCED
NUCLEAR ORIENTATION BY MEANS OF NEUTRON
DIFFRACTION. By M. Steiner, H. Dachs, Y. Ajiro,
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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 $\text{CoF}_2$ whose intensity is propor-
tional to $P_N^2 (b^+ - b^-)^2$. At very low tempe-

tures ($T \leq 20$ mK) $P_N$ becomes large enough to
produce a measurable (001) Bragg peak in $\text{CoF}_2$.

Our results indicate that we have achieved
$P_N = 0.25$ corresponding to a nuclear tempe-

tature of 14 mK. The corresponding (001)-

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