ESRF	**Experiment title: High temperature phase transitions in BiFeO3 (Part 1, ID-31)**	**Experiment number**: HS-3659
Beamline: ID-31	**Date of experiment**: from: 11.05. 2009 to: 15.05.2009	**Date of report**: 26.08.2010
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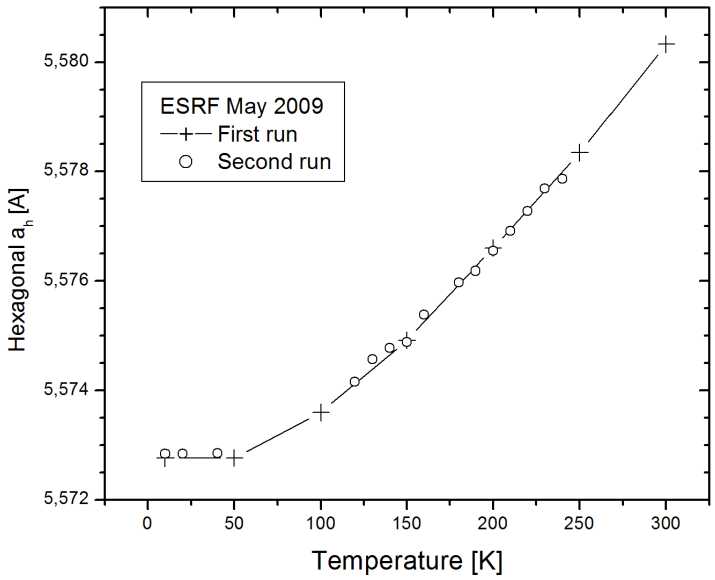
Report:

The crystal structure of BiFeO3 was studied at the high resolution powder diffraction beamline ID-31. The measurements at high temperatures above 700C were not performed because of the unstable work of the hot-ar blower which had fluctuations of temperature with an amplitude of about ±3°C over times much shorter than the time of an SR powder diffraction scan with a reasonable statistical accuracy. This temperature fluctuation prevents high resolution SR diffraction studies that were planned. Instead of the measurements at high temperature we performed measurements at low temperature. The main motiavtion of our studies comes from recent literature reports which show anomalies in the Raman spectra of BiFeO3 [1-3]. These anomalies observed near 140K and 210K were attrbuted to possible magnetic reorientations which might effect the crystal structure of BiFeO3 or the internal strains in BiFeO3.

The measurements were performed by using the cryostat which showed very good tharmal satbility over the time of a single SR powder diffraction scan. The measurements were perofrmed in two runs with temperature steps increasing at several temperatures between 10K and 300K. The second run has especially many temperature points in the vicinity of the

transition temperatures of 140 K and 210K [1-3]. Unfortunatley we still observe strong texture effects which were described in our earlier studies [4]. It was not possible to extract information about the atomic positions, but the values of the lattice constants were refined with large accuracy.



One can see a smooth temperature dependence of the a and c lattice parameters of $BiFeO_3$ observed in both runs. We do not see any sign of a phase transition around 140K and 210K.

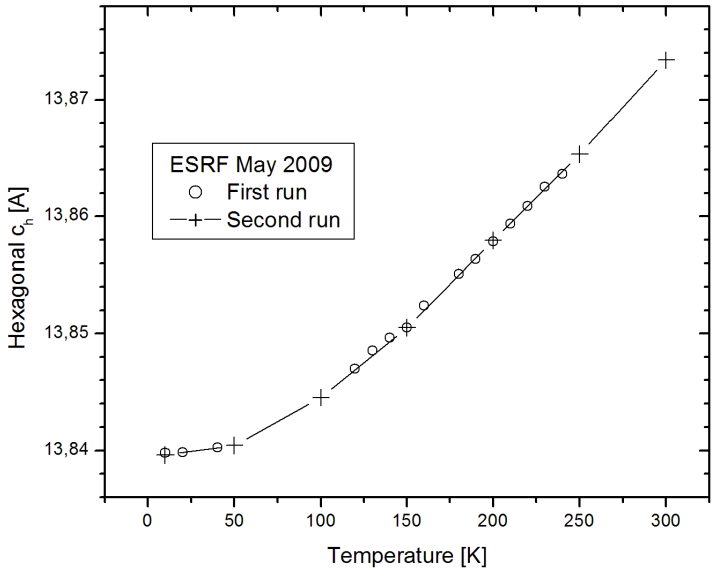


Fig.1 Temperature dependence of the a and c lattice parameters of $BiFeO_3$ (given in the hexagonal setting of the space group R3c)

References

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[4] A. Palewicz, T. Szumiata, R. Przeniosło, I. Sosnowska, I. Margiolaki, Sol. Stat. Comm. 140, 359 (2006).