ESRF	**Experiment title:** Critical phenomena under Verwey transition in $REBaFe_2O_{5+w}$	**Experiment number:** 01-01-226
Beamline: BM01B	**Date of experiment:** from: 20.09.2000 to: 03.10.2000	**Date of report:** 9.2.2001
Shifts: 12	**Local contact(s):** Mr. Hermann Emmerich	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):
Pavel Karen

Report:

Synchrotron x-ray powder diffraction data were collected for $GdBaFe_2O_{5+w}$ across the oxygen non-stoichiometry range of $-0.10 < w < 0.40$, as a function of temperature between 100 and 310 K. Up to the non-stoichiometry level of $w = 0.24$, an abrupt structural and volume change is monitored manifesting a Verwey-type transition of the first order. According to finely temperature-scaled diffraction scans, the transition has a small hysteresis, and peak analysis of the scans reveals that the two phases related by the discontinuous transition coexist with each other reproducibly over a small temperature range (Fig. 1), regardless of the w value and the particle size distribution in the powder sample. Deconvolutions of the instrument-broadening contribution to the Bragg-peak fwhm values allow to determine the extent to which this coexistence is caused by inhomogeneities in the oxygen content and to which other factors are involved. A sample with $w < 0.0$ remains to be measured, and, in order to complete the picture of the transition, fine scans should be performed above the transition temperature range to see whether premonitory thermal effects seen by DSC have any structural manifestations.
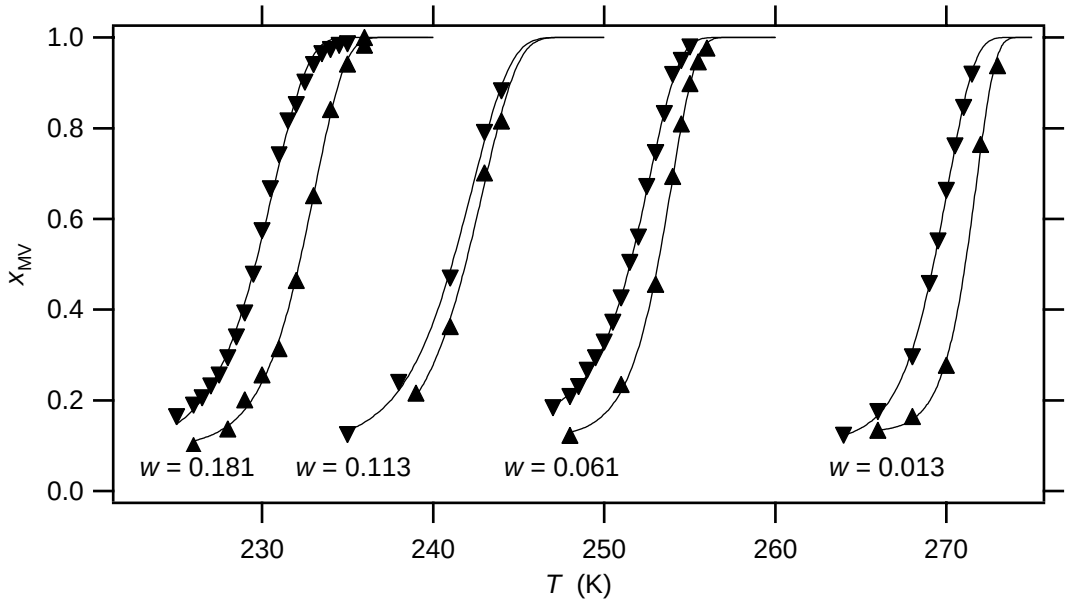
Fig. 1: Hysteresis of the Verwey-type transition in $GdBaFe_2O_{5+w}$. Triangles indicate heating or cooling.