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High-pressure diffraction study on cobalt ferrite spinels

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High pressure angle-dispersive x-ray diffraction measurements on CoxFe2-xO4 (x=1, 1.5, 1.75) spinels have been performed at the beam line MSPD in the ALBA synchrotron [1]. The patterns were collected at room temperature between ~0 and 34 GPa with an incident monochromatic wavelength of 0.4246 Å. Samples were loaded in 130 microns diameter holes of 40 microns thick stainless steel gaskets in DAC with diamond culet sizes of 300 microns. Two ruby grains were loaded with the sample for pressure determination [2] and a mixture of methanol and ethanol (4:1) was used as the pressure-transmitting medium. The three samples show a similar structural phase transformation from the cubic spinel structure to an analogous post-spinel phase at around 20 GPa as can be seen in Fig. 1 for the CoFe2O4 sample, for instance. Spinel and post-spinel phases coexist in a wide pressure range (~20 –25 GPa). The transformation is irreversible as measurements performed after releasing pressure revealed that the post-spinel phases are stable down to ~4 GPa and then, they decompose into a new phase with very broad diffraction peaks indicating a poor crystallinity. Neither the spinel nor the post-spinel phases can be recovered after a subsequent compression cycle. This phase transformation induced by pressure explains the irreversible loss of the ferrimagnetic behaviour reported for these spinels [3,4].

References

[1] F. Fauth, I. Peral, C. Popescu, M. Knapp, Powder Diffraction 28 (2013) S360-S370.
[2] H. K. Mao, J. Xu, and P. M. Bell, J. Geophys. Res. 91 (1986) 4673-4676.
[3] G. Subías, V. Cuartero, J. García, J. Blasco, S. Lafuerza, S. Pascarelli, O. Mathon, C. Strohm, K. Nagai, M. Mito, and G. Garbarino, Phys. Rev. B 87 (2013) 094408.
[4] J. Blasco, G.Subías, J.García, C.Popescu and V.Cuartero, J. Sol. State Chem. 221 173 (2015)

Caption (s) - Add figures as attached files (2 fig. max)

Figure 1. Powder x-ray diffraction patterns of CoFe2O4 at selected pressures. The asterisk marks the appearance of contribution from post-spinel phase while cross indicate the vanishing spinel phase. The pressure was increased and released as indicated by arrows on the right of the picture.

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