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Controlling the magnetic structure in W-type Hexaferrites

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Hexaferrites are important metal oxides, widely used as both permanent magnets and microwave absorbers. Recently, hexaferrites have attracted great interest, because they show magnetoelectric effects at room temperature. [1,2]
We have synthesized W-hexaferrites with varied Co/Zn ratio and investigated the magnetic order using neutron powder diffraction. In SrCo2Fe16O27 and SrCoZnFe16O27 a planar (Cm'cm') magnetic ordering was found, rather than the uniaxial (P63/mm'c') found in SrZn2Fe16O27, which is common in most W-type hexaferrites. Furthermore, in all three studied samples, non-collinear terms were present in the magnetic ordering, one of which is common to the planar ordering in SrCo2Fe16O27 and uniaxial ordering in SrZn2Fe16O27.
These non-collinear terms could be a sign of an imminent transition in the magnetic structure, which is further supported by thermomagnetic measurements. The thermomagnetic measurements revealed magnetic transitions at 520 and 360 K for SrCo2Fe16O27 and SrCoZnFe16O27, and Curie temperatures of 780 and 680 K, respectively, while SrZn2Fe16O27 showed no transition, but a Curie temperature at 590 K. Conclusively the magnetic transition can be adjusted by fine-tuning the Co/Zn stoichiometry in the sample. We believe a stoichiometry near SrCo0.65Zn1.35Fe16O27 would have the magnetic transition at room temperature, possibly giving rise to room temperature magnetoelectric effects.[3]

[1] Kitagawa, Yutaro, et al. "Low-field magnetoelectric effect at room temperature." Nature materials 9.10 (2010): 797-802.
[2] Song, Y. Q., et al. "Spin reorientation transition and near room-temperature multiferroic properties in a W-type hexaferrite SrZn1. 15Co0. 85Fe16O27." Journal of Applied Physics 115.9 (2014): 093905.
[3] Morch, M.I, Christensen M. "Controlling the Magnetic Structure in W-type Hexaferrites"Submitted

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