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Tuning the orientation of the magnetic spiral by doping in YBaCuFeO5 multiferroic

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The layered perovskite YBaCuFeO₅ is considered one of the best candidates to high-temperature spin-driven multiferroics. In RBaCuFeO₅ perovskites (R: rare-earth or Y) A-site cations are fully ordered and their magnetic properties strongly depend on the preparation process [1,2]. They exhibit partial cationic disorder at the B-site that generates a magnetic spiral stabilized through directionally assisted long-range coupling between canted locally frustrated spins [3]. Moreover the orientation of the magnetic spiral can be critical for its magnetoelectric response. We have synthesized and studied YBaCuFe_{1-x}MxO₅ doped samples, with the aim of increasing spin-orbit coupling effects, and found that the overall Fe/Cu cation disorder at the B-sites can be increased by doping without changing the sample preparation process [4,5]. In YBaCuFe_{1-x}MnxO₅ samples prepared under the same conditions, the T-x magnetic phase diagram have been constructed in the range 10K-500K combining magnetometry, XAS, synchrotron X-ray and neutron diffraction techniques. The tilting angles of the spins in the collinear, θ_{col} , and spiral phases, θ_{spiral} , barely vary with temperature. In the collinear phase θ_{col} is also independent of doping. In contrast, the presence of Mn produces a progressive reorientation of the spin rotation plane of the magnetic helix in the incommensurate non-collinear phase, capable to transform the helicoidal spin components into cycloidal ones, which may critically impact the ferroelectric and magnetoelectric response of the material. These findings are of interest for engineering and developing this family of potential high-temperature multiferroics.

[1] M. Morin et al., Phys. Rev. B. 91, 064408 (2015).

[2] T. Shang et al., Sci. Adv. 4, eaau6386 (2018).

[3] A. Scaramucci et al., Phys. Rev. Res. 2, 013273 (2020).

[4] X. Zhang et al., Acta Materialia 206, 116608 (2021).

[5] X. Zhang et al., J. Magn. Magn. Mater. 551, 169165 (2022).

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