



Contribution ID: 435

Type: Talk (17 + 3 min)

## Helimagnets by disorder: its role in the high- $T_S$ spiral magnet $\text{YBaCuFeO}_5$

Wednesday, 22 March 2023 17:40 (20 minutes)

Most of the spiral magnetoelectric multiferroics investigated in recent years are geometrically or exchange frustrated magnets with low magnetic transition temperatures. The exceptional stability of the spiral magnetic order (at  $T_S$ ) in the layered structure of  $\text{YBaCuFeO}_5$  [1,2] involves a non-conventional mechanism (“spiral order by disorder”) theoretically developed by Scaramucci et al. [3]. Using neutrons we have investigated the impact of tuning frustration through B-site disorder ( $n_d$ ) on the magnetic spiral phase in the reference compound  $\text{YBaCuFeO}_5$  [4]. The influence of disorder (and only disorder) on the magnetic phase diagram is studied on a quantitative basis. The interplay between disorder, stability and the detailed features of the incommensurate spiral magnetic orders has been investigated in samples of identical composition, spanning a wide range of  $n_d$  values. Three different regimes are distinguished in the  $\text{YBaCuFeO}_5$  phase diagram versus disorder, which set limits to  $T_S$  and the cycloidal component of the helicoidal order [4,5]. This layered structure appears as a very efficient realization of the new avenue to supply functional helimagnets at normal working temperatures.

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

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**Session Classification:** Bulk Magnetism 1

**Track Classification:** Magnetism, Superconductivity, Topological Systems, Magnetic Thin Films and other electronic phenomena