Magnetic phase diagram of the high-temperature spiral magnet $YBaCuFeO_5$

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Frustrated magnets with spiral magnetic phases are currently being intensively studied owing to their ability for inducing ferroelectricity. This could potentially be exploited in spintronics and low power memories devices.[1-2] However, the low magnetic order temperatures (typically < 100 K) in most of frustrated magnets greatly restrict their fields of application. One of the most notable exceptions are Cu/Fe-based layered perovskites, featuring magnetic spiral phases whose ordering temperatures can be continuously tuned far beyond RT. [3-5]. However, the influence of magnetic field on the magnetic structures especially spiral phases, imperative for further cross-control of the magnetic and ferroelectric orders, is barely known.

Here, we report a comprehensive description of the evolution of magnetic order in the layered perovskite $YBaCuFeO_5$ under the application of magnetic fields up to 9.0 T and at temperatures between 1.5 K and 300 K. Using bulk magnetization measurements and neutron powder diffraction we reveal the existence of a new incommensurate magnetic phase with a weak ferromagnetic component stable at low magnetic fields. Moreover, we observe a field-induced spin reorientation in the collinear phase. The resulting *H-T* phase diagram of $YBaCuFeO_5$ will be discussed, with emphasis in the magnetic phases with the largest potential to display strong magnetoelectric effects. [6]

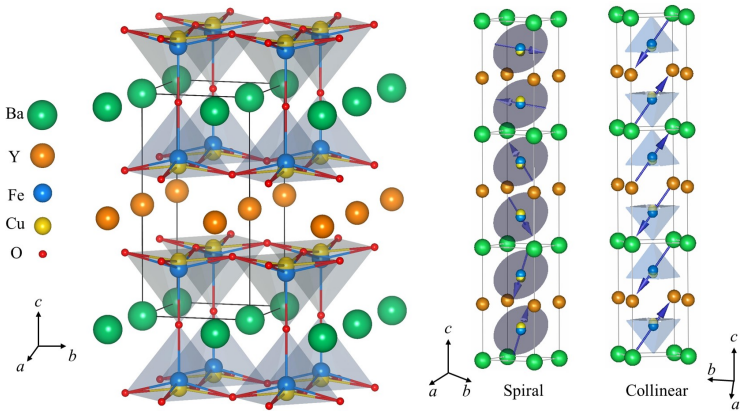

Figure 1. **Left:** Crystal structure of $YBaCuFeO_5$ showing the Cu/Fe disorder in the bipyramidal sites. Magnetic structure of the incommensurate spiral phase (**Middle**) and the commensurate collinear phase (**Right**).

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