Magnetoelastic phase diagram of TbNi2B2C

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The magnetic phase diagram of the quaternary borocarbide TbNi2B2C is investigated by direct means and by studying magnetoelastically induced modifications of the crystal structure. Detailed superconducting quantum interference device measurements reveal a complex phase diagram with five distinct magnetic phases. The phase boundaries are mapped out comprehensively. Synchrotron hard X-ray measurements in applied magnetic fields are employed to probe the magnetoelastic distortions throughout the phase diagram. The determination of the wave vectors of these field-induced lattice deformations suggests a range of commensurate spin-slip-type magnetic structures at low temperatures with wave vectors of the form \((q,0,0)\) with \(q = 6/11\) and \(5/9\). The proposed magnetic structures yield values of magnetization well in-line with observations. The scattering intensity due to the magnetoelastic deformations exhibits a drastic jump at the phase boundary at 1.3 T and low temperatures.

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