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Spontaneous lattice distortion in HoB4

The rare earth tetraboride HoB_4 was studied in detail by using X-ray powder diffraction in the temperature range of 3.5 − 8 K to investigate the crystal structure of this compound below its Neel temperature T_{N1} = 7.1 K. The system undergoes a first order transition of magnetic nature at T_{N2} = 5.7 K, yet the crystal structure is already distorted in between these two magnetic transitions. In fact, crystalline unit cell changes from the tetragonal symmetry with *P4/mbm* space group to a monoclinic symmetry. The ground state of this tetraboride compound at 3 K found to be best described by the space group $P2_1/b$. Furthermore, large bifurcation in unit cell volume between the warming and cooling cycle was observed, if the data are treated with tetragonal crystal symmetry - providing an additional support that the crystal structure is distorted indeed.

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