Magnetocaloric effect in iron-rich $PrFe_{11}Ti$ intermetallic alloy: A Comprehensive Investigation using Experimental and DFT calculation.

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In this study, we present a comprehensive investigation of the structural, magnetic, and magneto-caloric properties in iron-rich $PrFe_{11}Ti$ intermetallic alloy with $ThMn_{12}$ type structure using a combination of experimental and theoretical techniques. The structural characterization was performed using X-ray diffraction coupled with Rietveld refinement, which provided valuable information about the crystal structure and lattice parameters. Magnetic properties were studied through intrinsic magnetic measurements and magneto-caloric effect analysis, which gave insight into the magnetic ordering and response of the material to an external magnetic field. Mössbauer spectroscopy was employed to probe the local magnetic environment and to further characterize the magnetic properties of the material. The experimental results were complemented by theoretical calculations based on density functional theory (DFT), which allowed for the prediction and interpretation of the magnetic and electronic properties of the material.

Overall, our results provide a deeper understanding of the structural and magnetic properties of the material under study and demonstrate the effectiveness of the combined experimental and theoretical approach in the investigation of complex materials. The insights gained from this study could have implications for the development of advanced magnetic materials with enhanced properties for potential magnetic applications.