

# Magnetic and magnetocaloric properties of the Laves phase compound $\text{Sc}_{0.2}\text{Ti}_{0.8}\text{Fe}_2$

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$\text{Sc}_{1-x}\text{Ti}_x\text{Fe}_2$  intermetallic compounds were shown to host an interesting interplay between magnetic and structural properties, e.g. negative thermal expansion (NTE), with magneto-structural transitions of different types and characteristic temperatures depending on their exact compositions, some of them at room temperature<sup>[1][2][3]</sup>. In this work the magnetic properties and the magnetocaloric effect (MCE) in a polycrystalline sample of  $\text{Sc}_{0.2}\text{Ti}_{0.8}\text{Fe}_2$  were examined at low temperatures ( $T = 2 - 380$  K) and in fields up to 9 T. The system exhibits a complex magnetic structure, with a transition from paramagnetic (PM) to ferromagnetic (FM) ordering close to room temperature, and for lower applied magnetic fields both a FM to FM transition around 160 K and a FM to antiferromagnetic-like transition around 70 K. Isothermal measurements also showed that the magnetization of the sample increases with applied magnetic field, reaching  $0.7884 \pm 0.0001 \mu_{\text{B}} \cdot (\text{Fe})^{-1}$  at 5 K for fields of 9 T. The sample shows a soft ferromagnetic behavior, yielding a value of magnetic coercivity  $H_C = 2.7 \pm 0.1$  mT. The MCE in the system was evaluated from isothermal magnetization measurements and yielded a maximum value of magnetic entropy change  $|\Delta S_M| = 1.30 \pm 0.02 \text{ J kg}^{-1} \text{ K}^{-1}$  for a magnetic field change of 5 T at  $312.5 \pm 2.5$  K, with a relative cooling power RCP of approximately  $160 \text{ J kg}^{-1}$ . While still of limited magnitude, these values point towards this compound family being a possible baseline for producing Fe-based compounds with a low critical raw material content showing high RCP values at room temperature.

## References:

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