A Preisach approach to modeling partial phase transitions in the first order magnetocaloric material MnFe(P,As) - DTU Orbit (16/12/2018)

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Magnetic refrigeration is an emerging technology that could provide energy efficient and environmentally friendly cooling. Magnetocaloric materials in which a structural phase transition is found concurrently with the magnetic phase transition are often termed first order magnetocaloric materials. Such materials are potential candidates for application in magnetic refrigeration devices. However, the first order materials often have adverse properties such as hysteresis, making actual performance troublesome to quantify, a subject not thoroughly studied within this field. Here we investigate the behavior of MnFe(P,As) under partial phase transitions, which is similar to what materials experience in actual magnetic refrigeration devices. Partial phase transition curves, in the absence of a magnetic field, are measured using calorimetry and the experimental results are compared to simulations of a Preisach-type model. We show that this approach is applicable and discuss what experimental data is required to obtain a satisfactory material model.

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