Magnetic characterization and 3D-imaging of epoxy-bonded magnetocaloric composites

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Epoxy-bonded magnetocaloric composites of La-Fe-Co-Si with fractions of diverse particle size of active material were characterized. Their magnetic properties, as well as the temperature- and field-dependent specific heat capacity (c_P(T,H)) were determined. For comparison, a sintered La-Fe-Co-Si and a Gadolinium sample, which is a benchmark material for magnetocaloric materials, was measured. From the specific heat, entropy change ΔS and adiabatic temperature change ΔT_{ad} was calculated and compared with calculations from magnetic measurements (ΔS_{mag}) and direct measurements (ΔT_{direct}). Furthermore by using X-ray Computed Tomography (XCT) exact volume fractions of the active magnetocaloric material, the epoxy and the porosity were studied. Moreover the particles of active magnetocaloric material were analyzed concerning their size and form. We will discuss the magnitude of the magnetocaloric effect with respect to the portion of active magnetic material in the composite.

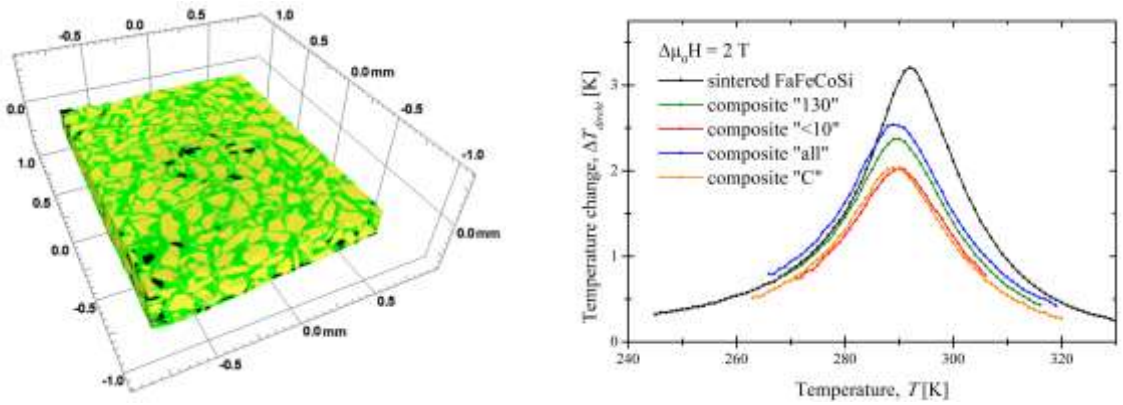

Fig.1: XCT visualization (left side) of a magnetocaloric composite with particles (yellow) matrix (green) and pores (black). Direct measured adiabatic temperature change of magnetocaloric composites and reference sample as a function of Temperature.