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Topology Optimization of Regenerators for Magnetic Refrigeration[1] FRIDOLIN OKKELS, GRIGORIOS PANAGAKOS, DTU Nanotech, Department of Micro- and Nanotechnology, Technical University of Denmark, Denmark — We show a free form geometrical optimization of a simple regenerator model and how it relates to improvements of magnetic refrigerator systems. Magnetic refrigeration systems utilize the magnetocaloric effect to separate the ambient temperature into hot and cold regions, through a thermodynamic cycle. In the specific model [1], a small-scale regenerator support the temperature difference, and we apply the method of topology optimization to improve the existing design. In order for the high-level implementation of topology optimization to work [2], the model has to be steady state, and therefore the refrigeration cycle has been reformulated, using harmonically varying fields, into an amplitude model. The amplitude model nicely reproduces the results from direct simulation of the thermodynamic cycle, and initial results from the topology optimization are presented.

[1] T. F. Petersen, "Numerical modelling and analysis of a room temperature magnetic refrigeration system," PhD-thesis, DTU Risø, Denmark (2007)
[2] L.H. Olesen, F. Okkels, and H. Bruus, Int. J. Num. Meth. Eng. 65, 975 (2006)

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