Study of geometries of active magnetic regenerators for room temperature magnetocaloric refrigeration - DTU Orbit (29/12/2018)

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Room temperature magnetic refrigeration has attracted substantial attention during the past decades and continuing to increase the performance of active magnetic regenerators (AMR) is of great interest. Optimizing the regenerator geometry and related operating parameters is a practical and effective way to obtain the desired cooling performance. To investigate how to choose and optimize the AMR geometry, a quantitative study is presented by simulations based on a one-dimensional (1D) numerical model. Correlations for calculating the friction factor and heat transfer coefficient are reviewed and chosen for modeling different geometries. Moreover, the simulated impacts of various parameters on the regenerator efficiency with a constant specific cooling capacity are presented. An analysis based on entropy production minimization reveals how those parameters affect the main losses occurring inside the AMR. In addition, optimum geometry and operating parameters corresponding to the highest efficiency for different geometries are presented and compared. The results show that parallel plate and micro-channel matrices show the highest theoretical efficiency, while the packed screen and packed sphere beds are possibly more practical from the application point of view.

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