2-dimensional numerical modeling of active magnetic regeneration - DTU Orbit
(11/02/2019)

2-dimensional numerical modeling of active magnetic regeneration
Various aspects of numerical modeling of Active Magnetic Regeneration (AMR) are presented. Using a 2-dimensional numerical model for solving the unsteady heat transfer equations for the AMR system, a range of physical effects on both idealized and non-idealized AMR are investigated. The modeled system represents a linear, parallel-plate based AMR. The idealized version of the model is able to predict the theoretical performance of AMR in terms of cooling power and temperature span. This is useful to a certain extent, but a model reproducing experiments to a higher degree is desirable. Therefore physical effects such as thermal parasitic losses have been included. Furthermore, experimentally found magnetocaloric properties are used when available, since the commonly used mean field model can be too idealized and is not always able to determine the magnetocaloric effect accurately. In the present paper preliminary conclusions on which non-ideal physical effects are thought to be dominating considering the performance of experimental AMR are given. The modeling results are compared to experimental results from the AMR test device situated at Risø DTU, Technical University of Denmark. The experimental validation shows that using the measured magnetocaloric properties significantly improves the modeling results compared to using the mean field model.

General information
State: Published
Organisations: Department of Mechanical Engineering, Fuel Cells and Solid State Chemistry Division, Risø National Laboratory for Sustainable Energy, Manufacturing Engineering
Contributors: Nielsen, K. K., Pryds, N., Smith, A., Bahl, C. R. H., Hattel, J. H.
Number of pages: 508
Pages: 251-258
Publication date: 2009

Host publication information
Title of host publication: 3rd International Conference on Magnetic Refrigeration at Room Temperature
Volume: 1
Publisher: International Institute of Refrigeration
Edition: 1
ISBN (Print): 978-2-913149-67-0
Keywords: Magnetic refrigeration, Fuel Cells and hydrogen, modeling, magnetocaloric effect
Electronic versions:
paper_thermag_final_submit.pdf
Source: orbit
Source-ID: 243292
Research output: Research - peer-review › Article in proceedings – Annual report year: 2009