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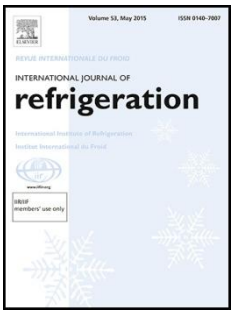

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A New Model of First-Order Magnetocaloric Materials with Experimental Validation

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Highlights

- New model for first order magnetocaloric materials
- Experimental results from a variety of test conditions for a multistage first order regenerator
- Statistical comparisons of modeled materials to measured materials
- Numerical predictions of experimental results

The use of new mathematical models to represent first-order magnetocaloric materials is reported. Three mathematical models with differing strengths and weaknesses are assessed. The material models are implemented in a numerical model to predict the cyclical performance of a magnetocaloric regenerator. Predictions using both measured and modeled material are compared. A prototype is used to confirm the predictions of the model as well as confirm performance trends related to the variables being investigated. The numerical model with measured and mathematically represented materials shows good correlation to experimental tests. The result is a new and useful method of representing magnetocaloric materials that can accurately predict results over a range of cyclical parameters.

KEYWORDS: Magnetocaloric, refrigeration, material modeling, first-order material, multistage regenerator.