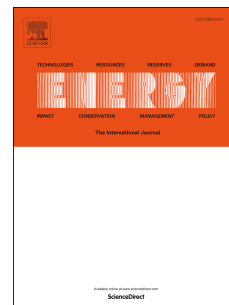


Accepted Manuscript

Numerical modeling of an active elastocaloric regenerator refrigerator with phase transformation kinetics and the matching principle for materials selection

Suxin Qian, Lifen Yuan, Jianlin Yu, Gang Yan



PII: S0360-5442(17)31636-5

DOI: [10.1016/j.energy.2017.09.116](https://doi.org/10.1016/j.energy.2017.09.116)

Reference: EGY 11610

To appear in: *Energy*

Received Date: 25 May 2017

Revised Date: 4 September 2017

Accepted Date: 24 September 2017

Please cite this article as: Qian S, Yuan L, Yu J, Yan G, Numerical modeling of an active elastocaloric regenerator refrigerator with phase transformation kinetics and the matching principle for materials selection, *Energy* (2017), doi: 10.1016/j.energy.2017.09.116.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Numerical modeling of an active elastocaloric regenerator refrigerator with phase transformation kinetics and the matching principle for materials selection

Suxin Qian*, Lifen Yuan, Jianlin Yu, Gang Yan

Department of Refrigeration and Cryogenic Engineering, School of Power and Energy Engineering, Xi'an Jiaotong University, Shaanxi, China 710049

*Corresponding Author

Tel: (+86) 29 - 82668738, Fax: (+86) 29 - 82668725, Email: qiansuxin@xjtu.edu.cn

Abstract

Elastocaloric cooling technology is a novel solid-state cooling technology based on the latent heat associated with martensitic phase transformation in shape memory alloys. The active elastocaloric regenerator concept was recently demonstrated as a promising approach for this technology. However, if not properly designed, the large temperature gradient in the active regenerators could lead to significant degradation of elastocaloric effect and system performance. To address this challenge, a numerical model was developed in this study with phase transformation kinetics of shape memory alloys, which is capable to investigate the stress-induced or temperature-induced phase change phenomena and elastocaloric effect degradation problem. The performance of an elastocaloric cooling system with a pair of active regenerators is studied in terms of operating frequency, flow rate, geometric parameters and thermal conductivity of the material. Most importantly, the condition to avoid eCE degradation was found as the matching principle to guide material selection for future studies.

Key words: solid-state cooling, elastocaloric cooling, thermoelastic cooling, shape memory alloys, phase transformation model

Nomenclature

AER active elastocaloric regenerator

Download English Version:

<https://daneshyari.com/en/article/8072657>

Download Persian Version:

<https://daneshyari.com/article/8072657>

[Daneshyari.com](https://daneshyari.com)