MAR15-2014-020518

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Elastocaloric cooling materials and systems

ICHIRO TAKEUCHI, University of Maryland and Maryland Energy and Sensor Technologies

We are actively pursuing applications of thermoelastic (elastocaloric) cooling using shape memory alloys. Latent heat associated with martensitic transformation of shape memory alloys can be used to run cooling cycles with stress-inducing mechanical drives [1]. The coefficient of performance of thermoelastic cooling materials can be as high as 11 with the directly measured DT of around 17 °C. Depending on the stress application mode, the number of cycles to fatigue can be as large as of the order of 10^5. Efforts to design and develop thermoelastic alloys with long fatigue life will be discussed. The current project at the University of Maryland is focused on development of building air-conditioners, and at Maryland Energy and Sensor Technologies, smaller scale commercial applications are being pursued. This work is carried out in collaboration with Jun Cui, Yiming Wu, Suxin Qian, Yunho Hwang, Jan Muehlbauer, and Reinhard Radermacher, and it is funded by the ARPA-E BEETIT program and the State of Maryland.

[1] Jun Cui, et al. "Demonstration of high efficiency elastocaloric cooling with large DT using NiTi wires," Applied Physics Letters 101, 073904 (2012).