3D Printed Ti-Ni Alloys Prepared by Selective Laser Melting for Solid-State Cooling Technologies

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Currently, shape memory alloys (SMAs), including NiTi-based alloys, are among the widely considered materials for developing alternatives to vapor compression HVAC technology. The aim of the present work is to study equiatomic NiTi elastocaloric materials prepared by 3D printing technology specifically Selective Laser Melting /SLM/ using pulsed and continuous mode.

The 1 cm^3 samples were characterized with differential scanning calorimetry, X-ray diffraction, electron microscopy including back-reflected electron diffraction and mechanical loading in compression. The porosity of the samples was from 1 to 20 % in dependence of the parameters of the SLM method. In terms of microstructure, the samples did not show preferential grain orientation in the direction of building or in the direction normal to building. The grain size ranged from 10 to 500 µm. Latent heat values range from 20 to 30 J/g.