Microstructure and Martensitic Transformation of Selective Laser Melted NiTi Shape Memory Alloy Parts

Carlo A. Biffi *, Jacopo Fiocchi, Paola Bassani and Ausonio Tuissi

National Research Council Institute of Condensed Matter Chemistry and Technologies for Energy, Unit of Lecco, CNR ICMATE; Via Previati 1/E, 23900 Lecco, Italy.

* Email: carloalberto.biffi@cnr.it

ABSTRACT

Additive Manufacturing allows to design and realize 3D parts, integrating additional functionalities offered by the interaction between complex shapes and the material properties. Results can be even more appealing when functional materials, like Shape Memory Alloys, are printed: new opportunities for smart devices can be opened.

In the present work Seletive Laser Melting on Nitinol powder was investigated for realizing both bulk and lattice structures. A pulsed laser, which is more suitable for manufacturing thin parts, was selected to process the initial powder. The selection of the process parameters, like laser power and exposure time, was performed for maximizing the relative density. Furthermore, microstructure, chemical composition and transformation temperatures of the martensitic transformation were analyzed through scanning electron microscopy, X-rays diffraction and differential scanning calorimetry. As term of comparison, a comparison between the initial powder and SLMed parts was taken into account for better understanding of the main highlights when NiTi powder is heated up by laser beam and then subjected by rapid cooling.