



Dr. Jianing Zhu  
Delft University of Technology  
Department of Materials Science and Engineering  
The Netherlands  
[J.zhu-2@tudelft.nl](mailto:J.zhu-2@tudelft.nl)  
[Home page](#)

### **Lecture Title: Laser Additively Manufactured NiTi Shape Memory Alloys**

The reversible martensitic transformation gives Nitinol (NiTi) shape memory alloys (SMAs) unique functional properties, including superelasticity and the shape memory effect (SME). Due to these attractive functional properties, SMAs are widely used as actuators, sensors, dampers, and medical implants. Laser additive manufacturing not only offers the flexibility to fabricate complex structures but also allows for tailoring microstructures, including crystallographic defects and textures. This lecture will introduce three aspects of laser additively manufactured NiTi: 1) Manufacturing Structural Defect-Free NiTi Components: This involves identifying various mechanisms of structural defect formation and corresponding strategies to avoid these defects. 2) Establishing the Processes-Microstructures-Properties Framework: Efforts are being made to create a framework that links the manufacturing processes to microstructures and properties in additively manufactured NiTi. 3) Manufacturing Multi-Modal and Metastructured NiTi Components: Building on the understanding of bulk NiTi manufacturing, functionally graded and architected NiTi components have been fabricated to expand their functional applications.

Keywords— *Additive manufacturing, shape memory effect, superelasticity, crystallographic texture*