BoKoMaT

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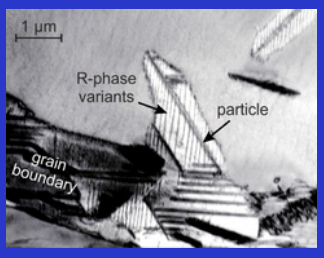
Prof. Dr. Gunther Eggeler

Seniorprofessor at Chair Materials Science and Engineering (BOKOMAT Management)

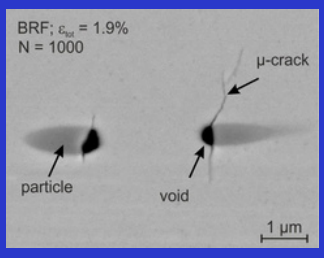
Ruhr University Bochum

Particles in Shape Memory Alloys: Effects on Functional and Structural Properties

Shape memory components exploit the thermal (one way effect, 1WE) and mechanical memory (pseudoelastictiy, PE) of shape memory alloys, which rely on the martensitic forward and reverse transformation in shape memory alloys (SMAs). When making shape memory alloy (SMA) components, one cannot avoid the formation of small particles in the microstructure. These can form as metastable precipitates like Ni_4Ti_3 in Ni-rich near equiatomic NiTi alloys. There can be brittle oxides and/or carbides (in NiTi-based alloys: TiO and TiC) which result from uptake of carbon (C) and oxygen (O) during different processing routes. The presentation starts with a brief review of the elementary process which govern1WE and PE. It then takes an overarching look on why and how SMA particles form, how they affect local alloy chemistry, local stress/strain states and local microstructures and how they can alter structural and functional properties of SMA components. Two examples are shown in Figure 1.



(a)



(b)

Examples for the effect of SMA particles on phase transition temperatures, hysteresis widths, microstructure evolution and mechanical properties are presented and discussed. Areas in need of further research are identified. Emphasis is placed on the technological importance of particles in SMAs.

Gunther Eggeler and Jan Frenzel (Institute for Materials, Ruhr-University Bochum, RUB) and Jaume Pons (Department of Physics, University of the Balearic Islands, UBI)