TRANSILVANIA University of Brasov
BRAMAT 2017
10TH INTERNATIONAL CONFERENCE ON MATERIALS SCIENCE & ENGINEERING
9 - 11 MARCH 2017, BRASOV, ROMANIA

Organized by: Faculty of Materials Science and Engineering – **Transilvania** University of Brasov
Supporting Organizations: Academy of Technical Sciences of Romania – **ASTR,** Romanian Association of Heat treatment and Surface engineering – **ATTIS,** Romanian Foundry Technical Association – **ATTR,** Romanian Welding Society – **ASR**

PROPERTIES OPTIMISATION OF Ti-BASED BIOMATERIALS BY STRUCTURAL DESIGN

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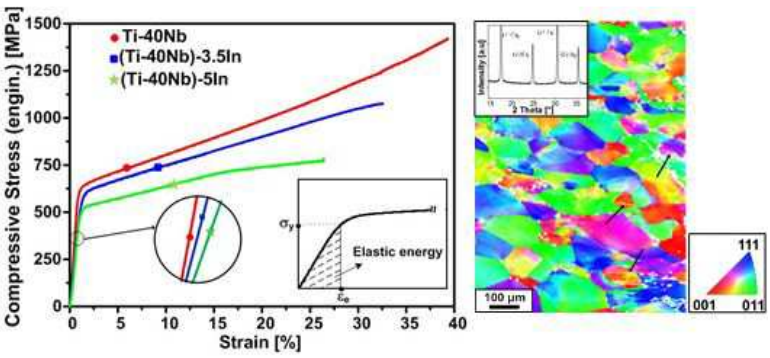
Keywords: titanium alloys, beta-type structure, mechanical properties

Abstract: Currently, titanium (Ti) and its alloys constitute the most favored implant metallic materials in the field of trauma and orthopedic surgery. However, despite the high rates of success of Ti-based implant materials, there still are serious problems of safety and long-term durability in the human body, resulting in repeat of surgical operations. Therefore, much research effort is dedicated to the development of new metastable Ti-based alloys with improved mechanical performance and biological compatibility.

Ti-based alloys offer a wide range of adaptable structures for use in different medical applications, especially in orthopedics. In the focus of our studies are the Ti-Nb-based alloys with various metastable structures (β-type, martensitic, nanostructured, glassy), which are processed by controlled casting and/or severe plastic deformation as bulk material or by powder metallurgy as porous compacts [1, 2]. In the present paper we will show that by tailoring specific nanostructures (for example with bimodal grain-size distribution or ultrafine/nano-scaled grains with non-equilibrium grain boundaries) can produce unique combinations of properties, such as high strength and good ductility combined with high corrosion and wear resistance.



Stress strain curves and microstructures of β Ti-Nb alloys.

Selective references:

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Acknowledgements: Financial support by the EC (FP7 VitriMetTech – MC ITN) and DFG (SFB/TRR 79) is gratefully acknowledged.