MINISYMPOSIUM

CYCLIC DEFORMATION BEHAVIOUR AND FATIGUE OF METASTABLE, HIGH ENTROPY AND SMART MATERIALS

1. Thematic session title

CYCLIC DEFORMATION BEHAVIOUR AND FATIGUE OF METASTABLE, HIGH ENTROPY AND SMART MATERIALS (METASIMS)

2. Organizers, including affiliations

Marek Smaga (University of Kaiserslautern, Kaiserslautern, Germany)

Jerzy Kaleta (Wroclaw University of Science and Technology, Poland)

Rafał Mech (Wroclaw University of Science and Technology, Poland)

Grzegorz Litak (Lublin University of Technology, Poland)

Marek Borowiec (Lublin University of Technology, Poland)

Andrzej Koszewnik (Bialystok University of Technology, Poland)

3. Corresponding organizer and contacts (e.g. e-mail, phone)

Dr Marek Smaga

University of Kaiserslautern, Kaiserslautern

Email: **smaga@mv.uni-kl.de** or **icmfmxx@pwr.edu.pl**

Dr Rafał Mech

Faculty of Mechanical Engineering

Wroclaw University of Science and Technology

Email: **Rafal.Mech@pwr.edu.pl** or **icmfmxx@pwr.edu.pl**

4. Short description of the symposium including the scope and target public

In metastable materials, like TRansformation-Induced-Plasticity (TRIP) or TWinning- Induced-Plasticity (TWIP) steel during mechanical loading besides formation and slip of dislocations a phase transformations as well as twinning occurs. This effects influence significantly the cyclic deformation behaviour and consequently the fatigue properties of these materials. Hence, due to deformation-induced martensitic transformation, the change in magnetic properties, namely the transformation from paramagnetic gamma-austenite into ferromagnetic alpha′-martensite take

place. Because, the magnetic properties can be measured non-destructively, the material can be used as an intrinsic sensor for detection of the fatigue process. In Shape Memory Alloys (SMAs), for example, Heusler alloys, magnetic and/or temperature-induced phase transformation take place, to realize the functionalization of these materials. However, the phase transformation leads to huge strain. Due to cyclic magnetic and/or thermal loading, the change in crystallographic microstructure can occur, which lead to change in the cyclic deformation behaviour. Consequently, the functionalization of these materials can be lost and/or fracture of the material can obtain. Smart materials (SM) and structures are capable of sensing external conditions and as a result, can respond in a way that improves the performance of the system in which they are incorporated. Thus, smart materials are capable to work as a sensor or actuator according to the desired task that they are supposed to perform. Introduction of smart materials into the different types of matrices, allow producing composite materials, which give a possibility to obtain new material with other properties. Nevertheless, the need to produce reliable functional parts require also information about mechanical properties including fatigue and fracture of developed multi-functional materials.

The present symposium intends to gather researchers in a scientific discussion aimed at establishing the current understanding of the mechanical and physical properties as well as the interaction of both properties in metastable alloys, shape memory alloys and smart materials. Hence, investigations of fatigue and fracture of crystalline High Entropy Alloys (HEAs), amorphous Bulk Metallic Glasses (BMGs) and Smart Materials (SM) are warmly welcome. Contributions are welcome on the following topics, among others:

- Cyclic deformation behaviour,
- LCF, HCF and VHCF,
- TRansformation-Induced-Plasticity / TWinning- Induced-Plasticity (TRIP/TWIP) steels,
- Shape Memory Alloys (SMAs)
- High Entropy Alloys (HEAs),
- Bulk Metallic Glasses (BMGs),
- Fatigue of TRIP/TWIP steels,
- Fatigue of SMAs,
- Fatigue of HEAs,
- Fatigue of BMGs,
- Fracture of TRIP/TWIP steels,
- Fracture of SMAs,
- Fracture of HEAs,
- Fracture of BMGs,

- Smart materials and their applications under cyclic load,
- Fatigue and fracture SMs,
- Energy harvesting,
- Experimental Mechanics of smart materials and their composites,

Selected papers of the H-ICMFM2020-VHCFSIMS will be encouraged to be submitted to journals associated with the ICMFM2020.

Please submit your work by email to **smaga@mv.uni-kl.de, Rafal.Mech@pwr.edu.pl** or **icmfmxx@pwr.edu.pl** with subject H-ICMFM2020-VHCFSIMS