Micromechanics under extreme conditions: high strain rate testing

Szilvia Kalacska*[1]

[1]Laboratoire Georges Friedel, CNRS – Ecole des Mines de Saint-Etienne, Université de Lyon, Centre National de la Recherche Scientifique – France

Abstract

Materials often exhibit different mechanical properties (e.g., strength, ductility, and toughness) at high strain rates (HSR) compared to quasi-static conditions. HSR testing reveals strain rate sensitivity, critical for designing materials for dynamic environments. Some materials undergo phase transformations or changes in their microstructure depending on the deformation speed, that can significantly affect their performance. Exploring strain rate sensitive properties can reveal anomalous behaviour, providing crucial input for simulations developed for dynamic event modeling. The presentation will highlight the state-of-the-art capabilities of HSR micromechanical testing performed on various materials, such as single/dual phase metals (1) and additively manufactured samples (2).
References:

(1) S. Kalácska, A. Sharma, R. Ramachandramoorthy, Á. Vida, F. Tropper, R. Pero, D. Frey, X. Maeder, J. Michler, P. D. Ispánovity, G. Kermouche, Micromechanics reveal strain rate dependent transition between dislocation mechanisms in a dual phase high entropy alloy. (2024) DOI: 10.48550/arXiv.2409.20368

(2) S. Kalácska, L. Pethö, G. Kermouche, J. Michler, P. D. Ispánovity, Anomalous strain rate sensitivity of a Cu/Al2O3 multi-layered thin film. (2024) DOI: 10.48550/arXiv.2407.21392

*Speaker