

Metal Matrix Composites: Characterization and Modeling of Properties and Material Behavior under Different Loading Conditions

Hossein Darban, Michał Basista

Institute of Fundamental Technological Research, Polish Academy of Sciences

Metal matrix composites (MMCs) are advanced engineering materials used in aerospace, automotive, and energy applications, where they operate under demanding environments involving complex loading, high temperatures, and chemical degradation. Designing reliable structural components requires an understanding of their behavior under both quasi-static and dynamic conditions as well as chemically aggressive environments. The desired material characteristics can be achieved through a proper design of microstructural details and verified on a numerical prototype of the final component, prior to its production and experimental validation. On the other hand, MMCs may be better exploited by the understanding of the phenomena occurring at the microscale.

The thematic session will center on the experimental characterization and modeling of MMCs' performance under various conditions, including static and dynamic loading, creep and fatigue, chemically corrosive environments, wear, etc. Presentations on the damage and fracture processes, residual stresses, interfaces, and their influence on material performance across different scales are particularly encouraged. These presentations may include experiments and numerical simulations, such as finite element techniques, phase field modeling, and particle-based simulations.