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IMPACT DYNAMICS OF BRITTLE, DUCTILE, AND HYBRID COMPOSITES

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ABSTRACT

Modern composites are utilised in various strategic industrial sectors, including aerospace, nuclear power plants, and space exploration. Following the experimental observations on the composites, the most important aspect is their microstructure for the composites' loading resistance (mechanical or thermal). Advanced composite materials feature complex internal multiphase structures, including polycrystals, layered materials, FGM, and others. They can be brittle, ductile, and hybrid, which means they have both features. The materials are used in structures of high importance, for example, cutting tools, drilling devices, jet engines, military applications, and many others.

In the minisymposium, attention is paid to the effects of the microstructure of the composite materials on their strength. In particular, the following effects occur during impact load, and they are of interest:

- Phase transformation during impact load,
- Properties of the interfaces between phases,
- High strain rate in the metallic phase,
- Coupled problem of heat generation in the metallic phase,
- Fracture of the brittle phases,
- Damage development in metallic and brittle phases,
- Atomistic simulations of the interfaces between the phases under high pressure induced by the impact.

Examples of such advanced materials are multiphase polycrystals (e.g. WC/Co, SiC/Al, Al_2O_3/Ti(C, N)/ZrO_2), CMCs, MMCs, and others. The combination of phases of different properties yields a complex, usually random microstructure.

The experiments that can verify the numerical approach and are presented with the relevant numerical approach are highly encouraged.

The minisymposium aims to establish a common platform for discussing numerical methods, their validation, and practical applications of complex composite materials..