Shock and Vibration

Special Issue on

# Behavior of Material under Extreme Shock Conditions

# CALL FOR PAPERS

Structures experience extreme shock conditions when projectiles impact them at very high velocities or they are subjected to high magnitudes of pressure. During such impact events, materials are dynamically deformed through the process of shock and stress wave propagations and interactions, which can result in severe plastic deformations and penetration. These phenomena typically occur over few microseconds. Impact of micrometeorites on a space ship is an example of such conditions. Similarly, materials can be exposed to extreme thermal shock generated by intensive heating sources such as laser and ion beam bombardment. This thermal shock can induce changes in the microstructure and/or the surface morphology of materials. These processes can also induce plastic deformation in the target materials, which in turn impact their mechanical and fracture behavior. Ion energy, pulse time, and fluence control the intensity of the thermal shock induced by laser-induced plasma.

While the behavior of structures under some moderate shock conditions is reasonably well understood and predictable, extreme shocks offer several challenges. For example, it is difficult and expensive to conduct experiments for use in comparison with simulation. It is also relatively expensive to conduct experiments designed to improve input physics models. These experiments require sophisticated and expensive diagnostic systems and very specialized platforms. Additionally, the models describing the behavior of materials under extreme shock conditions including equations of the state describing shock propagation are difficult to characterize. The numerical techniques used in simulating these processes are not computationally expensive but typically are unable to capture the experimental results fully.

These factors require collaborations between researchers to address these extreme shock conditions topics.

Potential topics include, but are not limited to:

- Development of new material models or modifying existing ones
- Proposing/modifying equations of the state
- Conducting experiments to obtain the parameters of material models
- Conducting experiments on both simple (mono)materials and composite structure
- Development of diagnostic systems that are inexpensive compared to current techniques
- Proposing mathematical approaches to process experimental data
- Exploring simulation techniques that can reliably simulate experiments

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