TIFR Centre for Interdisciplinary Sciences
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Seminar

Shock wave propagation in composites and active materials

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Under the application of high strain rate loading, like impact of a projectile on a target, shock waves travel through a material. These waves are characterized as a discontinuity propagating through the system across which material properties jump. They can cause materials to reach very high stress states and if transmitted without mitigation, can lead to failure of key components. It is hence important to understand how shock waves propagate in heterogeneous materials. Shock waves are also being used to obtain pulsed currents and voltages of very high magnitude from active materials like ferroelectrics and ferromagnets. So it is important to characterize the large deformation dynamic behavior of active materials.

In this talk, I will discuss my work on shock wave propagation in composites and active materials. We start with a plate impact problem on a layered (not necessarily periodic) target. We obtain analytic solution to the entire wave propagation problem and study the influence of different parameters and arrangement of layers on the shock propagation. Next we study a front propagation problem in a stationary ergodic medium. Using the concepts of viscosity solutions and stochastic homogenization, we obtain local probabilistic bounds on the front roughness. Finally we look at the impact problem on a ferroelectric material. We develop a continuum theory of the dynamic large deformation behavior of a ferroelectric material. We derive the driving force and the governing equations of the process.

Monday, Oct 27th 2014

11:30 AM (Tea/Coffee at 11:15 AM)

Seminar Hall, TCIS