

# **Large Scale High Resolution Numerical Simulation of Explosion and Impact Problems**

Cheng Wang (王成)  
*Beijing Insititute of Technology*

Explosion and impact are nonlinear problems where a variety of media, such as gas, solid and liquid, strongly interact under high speed, high temperature and high pressure conditions, formidable challenge is imposed on the theoretical and experimental research. Due to such advantages as confidentiality, design flexibility, environment and process controllability and high cost-effective ratio, numerical simulation becomes the main approach to investigate such problems. This paper introduces in detail high resolution computations of explosion and impact problems, high order numerical boundary condition, positivity preserving and multi-medium interface treatment by the authors in recent years. Based on Level Set and Moment of Fluid method, the computational method that can address high density and high pressure ratio is proposed. High order finite difference weighted essentially non-oscillatory (WENO) method is generalized to solve the explosion problems with chemical reaction source terms. Based on this, a high resolution large scale parallel computation software was developed for explosion and impact problems. The code can simulate problems such as gas detonation, initiation of condensed-phase explosives, detonation diffraction, shock wave interaction with bubbles, underwater explosion. By constructing artificial solutions and comparison with experimental results, the accuracy and computation results of the computation method are validated and verified.