

# SHOCK WAVES, EXPLOSIVES AND PROPELLANTS

TEXT and CD-ROM - Numerical Modeling of  
Explosives and Propellants, CRC Press

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## COURSE OUTLINE

### SHOCK WAVES

- Fundamental Shock Wave Hydrodynamics
- Shock Hugoniot
- Shock Matching
- Equation of State
- Elastic-Plastic Flow
- Phase Change
- Oblique Shock Reflection
- Regular and Mach Shock Reflection
- Shock Wave and Equation of State Data Bases
  - Shock Hugoniot Data
  - Shock Wave Profile Data
  - Radiographic Data
  - Explosive Performance Data
  - Aquarium Data

### EXPLOSIVE TECHNOLOGY

- Primary and Secondary Explosives
- Deliberate and Accidental Initiation
- Homogeneous Explosives
- Heterogeneous Explosives
- Shock Initiation and Failure Diameter
  - Wedge Tests and the Pop Plot
  - Gap Shock Sensitivity Test
  - Drop Weight Impact Test
  - Skid Test
  - Spigot Test and Projectile Impact Test
- Thermal Initiation
  - DTA - Differential Thermal Analysis
  - Pyrolysis Test
  - Henkin Time to Explosion Test
  - DSC - Differential Scanning Calorimetry
- Spark Sensitivity Test
- HE Processing
- Data Sources

## PERFORMANCE OF EXPLOSIVES AND PROPELLANTS

- Steady-State Explosives
- Nonideal Explosives
  - Ammonium Salt-Explosive Mixtures
  - Ammonium Nitrate-Fuel Oil (ANFO) Mixtures
  - Metal Loaded Explosives
- Nonsteady-State Detonations
  - Build-Up in Plane Geometry
  - Build-Up in Diverging Geometry
  - Build-Up in Converging Geometry
  - Chemistry of Build-Up
- Propellant Performance

## INITIATION OF DETONATION

- Thermal Initiation
- Explosive Hazard Calibration Tests
- Shock Initiation of Homogeneous Explosives
  - Hot Spot Initiation of Homogeneous Explosives
  - Hot Spot Formation and Initiation
- Shock Initiation of Heterogeneous Explosives
  - Hydrodynamic Hot Spot Model
  - Shock Sensitivity and Composition
  - Particle Size and Temperature Effects on Shock Sensitivity
- The Forest Fire Model
  - Corner Turning
  - Failure Diameter
  - Desensitization of Explosives by Preshocking
  - Projectile Initiation of Explosives
  - Burning to Detonation

## MODELING HYDRODYNAMICS ON PERSONAL COMPUTERS

- Numerical Solution of One-Dimensional Lagrangian Reactive Flow
- Numerical Solution of Two-Dimensional Lagrangian Reactive Flow
- Numerical Solution of Two-Dimensional Eulerian Reactive Flow
- Numerical Solution of Three-Dimensional Eulerian Reactive Flow

## DESIGN AND INTERPRETATION OF EXPERIMENTS

- Plane-Wave Experiments
- Explosions in Water
- The Plate Dent Experiment
- The Cylinder Test
- Jet Penetration of Inerts and Explosives
- Plane Wave Lens
- Regular and Mach Reflection of Detonation Waves
- Insensitive High Explosive Initiators

- Colliding Detonations
- Shaped Charge Jet Formation
- Proton Radiographic Experiments

#### THE DETONATION WAVE

- Steady-State Detonations
- Resolved Reaction Zone Detonations
- Three-Dimensional Reaction Zones of Explosives
- Experimental Observations