

## Abstract

### Micromechanics-based Determination of Effective Elastic Properties of Polymer Bonded Explosives

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Polymer bonded explosives (PBXs) are primarily used as propellants for solid rockets. These materials are particulate composites containing high volume fractions (> 90%) of explosive crystals coated by a rubbery binder. The ratio of the Young's modulus of the crystals to that of the binder can be as high as 20,000. Experimental determination of the effective properties of PBXs is hazardous and therefore expensive. On the other hand, accurate numerical simulations can be computationally prohibitive. In this research, an approximate method for determining the effective elastic properties of these composites, called the Recursive Cells Method (RCM), has been developed. The RCM technique is explored and applied to a specific polymer bonded explosive, PBX 9501. The calculated effective properties are compared with those obtained from detailed finite element calculations.

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