

Cheetah, v10

Category

Software

Cheetah, v10 thermochemical code is available for U.S. government and authorized U.S. government contractors

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Description

High-explosive detonations are violent, high-energy release processes that at first appearance can seem difficult to predict and control. Nevertheless, they involve well-defined physical and chemical phenomena whose understanding has significantly evolved during the last decades. This evolution has led to tremendous progress in the broad field of explosives and energetic materials.

The ability to predict the characteristics of a particular detonation, e.g. the momentum and energy that it can deliver in a practical application, is crucial to the safe and efficient use of explosives.

“Cheetah,” an LLNL thermochemical computer code, is a physics- and chemistry-based computational tool that can reliably predict the performance of ideal and non-ideal high explosives and explosive formulations. Cheetah is the premier energetic materials code addressing explosives, pyrotechnics and propellants. It is an important formulation tool also.

Cheetah employs advanced concepts and theories of fluids and solids at high pressures and temperatures to model the thermodynamics of explosion products that result from the detonation of modern condensed, energy-dense explosives.

By using these models in the framework of the Chapman-Jouguet theory of detonation, Cheetah accurately calculates—often within 1 percent—fundamental high explosive features such as detonation velocity, Chapman-Jouguet pressure, mechanical energy and more.

However, Cheetah is not limited to high explosive calculations. Cheetah also can predict the thermodynamic behavior of many complex materials, from organic fluid mixtures, to fluid-solid mixtures, to plastics, at extreme conditions that are typical for shock waves, laser experiments, or the interior of the Earth.

Cheetah also presents an expanding capability to model chemical and physical kinetics. When used in conjunction with advanced hydrodynamics simulations, this capability enables a complete and essentially interactive study of complex fundamental and applied energetic materials problems.

The Cheetah code is Official Use Only, Export-Controlled, and it cannot be shared or redistributed. For further information, please contact Sorin Bastea at sbastea@llnl.gov or softwarelicensing@llnl.gov.

