

CFD Simulation of Homogeneous Nitrate Ester Propellant Decomposition in a Fluidized Bed Reactor

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Homogeneous double base nitrate esters have found widespread use as gun propellants. However, their safe and efficient disposal still remains enigmatic. In this work, a CFD simulation of the thermal decomposition of a double base propellant with a composition of 52% nitrocellulose (NC), 43% nitroglycerine (NG), and 5% additives in a fluidized bed. One condensed phase reaction (CPR) and three gas phase reactions following a kinetic analysis are modelled with user defined functions (UDF) as source terms to the governing equations of mass, momentum and energy solved in FLUENT to predict the optimum operating conditions at which the fluidized bed may be operated for the disposal of such hazardous wastes.

Keywords: fluidized beds, Multiphase flow, NC, NG, Thermal decomposition, CFD

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