

Reaction initiation and propagation in gasless systems is investigated. Such exothermic reactions in powder mixtures are of special interest in combustion synthesis of advanced materials, reactive welding, and defense applications. In this work, a macroscopic mathematical model of reaction propagation in mechanically milled mixtures (Ni-Al as an example) is developed which takes into account spatial variability of the reaction kinetics due to material heterogeneity. Unsteady numerical FEM simulations based on this model indicate that the reaction propagates as a discrete combustion wave exhibiting irregular temperature front oscillations, in qualitative agreement with experimental results.