Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

What Zeldovich did not tell us about spontaneous reaction wave propagation DAVID R. KASSOY, University of Colorado, Boulder: retired — Zeldovich (Comb. Flame, 39, 211-214, 1980) describes a conceptual model for a "spontaneous reaction wave" propagating down an initially imposed negative temperature gradient in a reactive gas. The concept is based on a sequence of constant volume thermal explosions in neighboring reactant particles of lower and lower temperature **where the interaction between the particles is neglected**. This restriction prevents nonlinear gasdynamical evolution arising from the response of a compressible gas to localized, transient thermal power addition. Gu et al. (Comb. Flame, 133, 63-74, 2003) employ a nondimensional temperature gradient parameter (actually the inverse Mach number of the propagating front) to distinguished between computationally determined diverse modes of reaction front propagation arising from spherical hot spots with imposed initial negative temperature gradients in a motionless, constant pressure gas. Two questions arise from these formulations: 1. Under what conditions can such an initial state arise? 2. Can the nondimensional parameter as used by Gu et. al. be derived from a fully compressible reactive gasdynamical formulation of their problem? These questions are addressed by employing thermomechanical principles described by Kassoy (J.Eng. Math, 68, 249 -262, 2010).

David R. Kassoy
University of Colorado, Boulder: retired

Date submitted: 09 Jul 2013 Electronic form version 1.4