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D'yakov-Kontorovich Instability in Non-Adiabatic Supersonic Fronts[1] CSAR HUETE, Universidad Carlos III De Madrid, FRANCISCO COBOS-CAMPOS, Universidad de Castilla-La Mancha, ERNAZAR ABDIKAMALOV, Nazarbayev University, SERGE BOUQUET, Commissariat a l'Energie Atomique
— As firstly predicted by D'yakov and Kontorovich (DK), an initially disturbed shock front may exhibit different asymptotic behaviours depending on the slope of the Rankine-Hugoniot curve. Adiabatic and isolated planar shocks traveling steadily through ideal gases are stable, in the sense that any perturbation on the shock front decays in time with the power $t^{-3/2}$. In this work, it has been found that unstable conditions are might be found when the gas undergoes an endothermic or exothermic transformation behind the shock. In particular, it is reported that constant-amplitude oscillations can occur when the amount of energy release is positively-correlated to the shock strength and, if this correlation is sufficiently strong, the shock turns to be fully unstable. The opposite highly-damped oscillating regime may occur in negatively-correlated configurations. The mathematical description then adds two independent parameter to the regular adiabatic index and shock Mach number, namely: the total energy added/removed and its sensitivity with the shock strength. The formulation in terms of endothermic or exothermic effects is extended, but not restricted, to include effects associated to ionization, dissociation, thermal radiation, and thermonuclear transformations.

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Cesar Huete Ruiz de Lira
Univ Carlos III De Madrid

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