Steady detonation problem for slow and fast chemical reactions

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Summary. Two sets of hydrodynamic equations for a mixture of four gases undergoing a bimolecular chemical reaction are discussed. The former consists in a system of balance laws for the case of a chemical relaxation time of the same order of the macroscopic processes (slow reaction). Conversely, the latter is a system of conservation laws for the case of short chemical relaxation time (fast reaction). After the analysis of the hyperbolic nature of the hydrodynamic equations, we formulate and solve the problem of the stationary propagation of a detonation wave. The differences of the shock structure in the two cases are shown by the presented numerical results.