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Shock wave structure reconstruction in reacting gases

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In a long time in Russia and abroad an influence of endothermic physical-chemical processes (dissociation, ionization) on stability and structure of shock wave flow was investigated. Three effects should be distinguished: flow instability in front of body bow in some polyatomic gases, instability of flow behind ionizing shock wave and reconstruction of shock wave flow structure in plasma of decay discharge of argon and air. It's well studied the shock wave instability in consequence of dissociation of some polyatomic gases behind bow shock wave. Analysis of spectra of disturbances energy in flow behind shock wave, calculation of interaction of model vortex with shock front showed that energy and time characteristics of disturbances calculated coincide with dissociation energy and disturbances evolution time in experiments. Physical mechanism of instability in reacted gases is connected with baroclined type of reacting flow behind bow shock wave. Further investigations of instability of planed-parallel flow indicate that instability is realized for high frequency disturbances. Such kind of instability is preferable for applications, but today there are now any catalysis for initiation of some processes needed for instability in air. In the same time there was finding like effect of shock wave destruction at spreading it in plasma of decay discharge in air. Last time attention was paid to influence of the effect on aerodynamics of bodies. There is some uncertainty in measurements of this influence: one indicates increase of body drag whereas another indicates decrease. This fact is clear for us, because our results of experiments after processing with aid of computer showed that results of drag measurements depend on conditions of experiment. This fact let us understand a physical mechanism of the effect which is connected with dispersion of wave energy due to the physical-chemical processes in plasma. Indeed this effect could not be due to thermal nor electro-dynamical effects. Experimental measurements in decaying plasma after offset of discharge show that and in long of 10 milliseconds (when there are no electrons) character of effect was the same as in plasma. In long of the same value of time in region of former discharge the main exited states of oxygen are remained and decayed. Bound values of shock wave velocity at which the shock wave still exist in plasma were explored. It is the speed of small disturbances responsible for effect investigated and coincides with quantity of speed calculated. At calculations physical-chemical processes and there influence on the sound speed were investigated on base of the gas kinetics theory. System of determining extensive parameters was revealed and then transition to the conjugate intensive thermodynamics parameters was realized.