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Modeling of vibration-dissociation oxygen kinetics at temperatures of 4,000-11,000 K. (English. Russian original) Zbl 1287.76234

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Summary: The time profiles of vibrational molecular oxygen temperature T_v measured earlier in experiments behind a strong shock wave were used for testing the theoretical and empirical models of thermal nonequilibrium dissociation of molecules. To do this, dissociating gas flows behind the strong shock wave front were calculated with account for these models. If the initial gas temperature behind the wave front $T_0 < 6.5 \times 10^3$ K, the models well describe changing the temperature with time. However, for $T_0 > 7 \times 10^3$ K neither of the models tested describes the measured temperature profiles satisfactorily. Using the empirical model proposed in the present study made it possible to satisfactorily describe the vibrational temperature evolution observed in experiments at temperatures up to 11×10^3 K.

MSC:

76V05 Reaction effects in flows
76L05 Shock waves and blast waves in fluid mechanics
76-05 Experimental work for problems pertaining to fluid mechanics

Keywords:

shock waves; oxygen; dissociation; thermal nonequilibrium; vibrational temperature; experiment; reaction rate constant; models of dissociation

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