REFINED DATA ON O_2 DISSOCIATION RATE MEASURED BY O-ARAS BEHIND SHOCK WAVES*

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Abstract: The formation of atomic oxygen in high-temperature gas flows affects both the thermodynamic state of the gas and the kinetics of proceeding chemical processes. During hypersonic and space flights, there is still a significant lack of understanding of the phenomena of flow around high-speed vehicles. One of the main reactions occurring in the bow shock zone is the dissociation of molecular oxygen into O atoms. Experimental studies of the kinetics of O_2 dissociation were carried out by various methods; however, the O_2 dissociation rate constants in modern combustion mechanisms still differ by orders of magnitude. Therefore, the clarification of these values is a very urgent task. In this work, precision measurements of the rate constant of oxygen dissociation performed by the ARAS (atomic resonance absorption spectroscopy) method in the temperature range of 2600–5000 K behind the reflected shock waves were carried out which made it possible to noticeably refine the previous data. The best fit to the present experimental data is given by the expression $k = 1.34 \pm 0.4 \cdot 10^{14} \exp(-(53620 \pm 2620)/T)$ cm^3/(mole·s).

Keywords: shock tube; atomic resonance absorption spectroscopy; molecular oxygen; dissociation rate constant

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