MOVEMENT AND AERODYNAMIC DRAG COEFFICIENT OF TITANIUM AND ALUMINUM PARTICLES DURING COMBUSTION IN AIR*

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Abstract: The results of a study of the movement of single large burning particles of titanium (200–550 μm) and aluminum (215–840 μm) in free fall in air are presented. To study the combustion of metal particles, a "model agglomerate method" based on the use of samples that generate burning particles of controlled size has been developed. The particles can be either initially monolithic or agglomerates formed during the experiment. Empirical approximating dependences of the coordinate $x(t)$ and velocity $v(t)$ on time were obtained for particles of different diameters. By comparing empirical and calculated dependencies $x(t)$ and $v(t)$, the effective aerodynamic drag coefficient of a particle was determined depending on its size.

Keywords: combustion; titanium particles; aluminum agglomerates; aerodynamic drag coefficient; particle movement

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Figure Captions

Figure 1 Videogram of the movement and combustion of an agglomerate particle — a sequence of frames with luminous segments that correspond to the displacement of the particle during the exposure time of the frame (1/25 s)

Figure 2 Dependencies $C_d(\mathrm{Re})$

Table Captions

Table 1 Approximation of the full trajectory

Table 2 Approximation of the unperturbed portion of the trajectory

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