

ON COMBUSTION OF ALUMINUM, BORON, AND THEIR COMPOSITIONS IN OXYGEN-CONTAINING ENVIRONMENTS

G. P. Kuznetsov¹, V. I. Kolesnikov-Svinarev¹, and I. G. Assovskiy^{1,2}

¹N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation

²National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation

Abstract: This paper presents the results of experimental study of condensed combustion products of single free particles of aluminum, boron, and their compositions in mixtures of oxygen with nitrogen and oxygen with argon at pressures from 2 to 40 atm. The strong influence of the oxidizing environment pressure and composition on the mass fraction of large particles in combustion products of aluminum has been revealed. This mass fraction is greatly reduced for the combustion products of particles of 90% Al + 10% B alloy.

Keywords: aluminum; alumina; boron; particle combustion; heterogeneous combustion; combustion products; condensed phase products of combustion; morphology of combustion products; size distribution of combustion products

References

1. Kazenas, E. K., and Y. V. Tsvetkov. 1997. *Isparenie oksidov* [Evaporation of oxides]. Moscow: Nauka. 543 p.
2. Assovskiy, I. G., V. I. Kolesnikov-Svinarev, and G. P. Kuznetsov. 2004. Nanocomposites synthesis in combustion of aluminum in carbon dioxide. *Nanocomposites: Development, production, application*. Eds. A. A. Berlin and I. G. Assovskiy. Moscow: TORUS PRESS. 113–116.
3. Kuznetsov, G. P., I. G. Assovskii, and V. I. Kolesnikov-Svinarev. 2009. Gorenje aluminiya v azote. Vliyanie davleniya na morfologiyu produktov [Combustion of aluminum in nitrogen. Effect of pressure on products morphology]. *Goren. Vzryv (Mosk.) — Combustion and Explosion* 2:55–57.
4. Assovskiy, I. G., G. P. Kuznetsov, and V. I. Kolesnikov-Svinarev. 2013. Gravity effect on product of aluminium combustion. *Elgra News. Bulletin of the European Low Gravity Research Association*. 28:150.

Received February 14, 2017

Contributors

Kuznetsov Genadiy P. (b. 1947) — PhD, senior scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; kuznetsov-47@bk.ru

Kolesnikov-Svinarev Vladimir I. (b. 1923) — PhD, senior scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation

Assovskiy Igor G. (b. 1946) — Doctor of Science in physics and mathematics, head of laboratory; N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; professor, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; assov@chph.ras.ru