Low-temperature atmospheric oxidation of mixtures of titanium and carbon black or boron

Journal	Combustion, Explosion, and Shock Waves
Publisher	Springer New York
ISSN	0010-5082 (Print) 1573-8345 (Online)
Issue	Volume 20, Number 1 / January, 1984
DOI	10.1007/BF00749915
Pages	38-42
Subject Collection	Physics and Astronomy
SpringerLink Date	Monday, December 13, 2004

V. A. Elizarova, V. I. Rozenband, I. V. Babaitsev, V. P. Gerusova and V. V. Barzykin

Received: 23 September 1982

Without Abstract

Chernogolovka. Translated from Fizika Goreniya i Vzryva, Vol. 20, No. 1, pp. 43–48, January–February, 1984.

Fulltext Preview (Small, Large)

decomposition products. Producing an explosion requires concentrated heating, impact, or the shock-wave effect of an initiator, leading to a chemophase transition [8].

This variant of the description of the derivatograms of decomposing materials by means of the equation $\mu = 1 - \theta^2$ is very simple. The structure of this equation was obtained theoretically in [9] on the assumption that the fragments — decomposition products — are of identical and minimum size. In other cases the dependence is much more complicated [9, 10], and the characteristic temperatures can be calculated only by numerical methods; however, the principle remains the same. If for a given substance the temperature of intense degradation is known, the dependence $\mu = 1 - \theta^2$ can be regarded simply as the most accessible approximating function for obtaining a solution in the first approximation.

LITERATURE CITED

1. D. A. Frank-Kamenetskii, Diffusion and Heat Transfer in Chemical Kinetics, Plenum Publ. (1969).
2. R. M. Aseeva and G. E. Zaikov, Combustion of Polymeric Materials [in Russian], Nauka, Moscow (1981).
3. V. A. Kirillin, V. V. Sychev, and A. E. Sheindlin, Technical Thermodynamics [in Russian], Nauka, Moscow (1979).
4. O. F. Shlenskii, Thermal Properties of Glass-Reinforced Plastics [in Russian], Khimiya, Moscow (1973).
5. A. A. Askadskii, Structure and Properties of Heat-Resistant Polymers [in Russian], Khimiya, Moscow (1981).
6. O. F. Shlenskii and N. I. Ermilova, Dokl. Akad. Nauk SSSR, 261, No. 4, (1981).
7. L. N. Aksenov, A. G. Shashkov, and O. F. Shlenskii, Inzh.-Fiz. Zh., 42, No. 6 (1982).
8. O. F. Shlenskii and G. G. Murashov, Dokl. Akad. Nauk SSSR, 264, No. 1 (1982).
9. O. F. Shlenskii and E. A. Baranova, Dokl. Akad. Nauk SSSR, 266, No. 2 (1982).
10. O. F. Shlenskii, G. M. Berman, and B. F. Khasin, Soobshch. Akad. Nauk GrSSR, 86, No. 2 (1977).

LOW-TEMPERATURE ATMOSPHERIC OXIDATION OF MIXTURES OF TITANIUM AND CARBON BLACK OR BORON

V. A. Elizarova, V. I. Rozenband,
I. V. Babaitsev, V. P. Gerusova,
and V. V. Barzykin

Mixtures of titanium with carbon black or boron are the starting materials for obtaining the commonest products of self-propagating high-temperature synthesis (SHS) — titanium carbide and boride [1]. These materials, present in various stages of the process (mixing, drying, storage, transport), are all the more hazardous inasmuch as extinguishing them involves considerable difficulties owing to the high degree of exothermicity of the reactions in which TiC and TiB_2 are formed and the presence of an intrinsic oxidizer (C, B). This accounts for the practical importance of studying the preignition low-temperature oxidation of mixtures of titanium with carbon black or boron in air. At the same time, the investigation of this process is also of scientific interest because under such conditions competing titanium/carbon black and titanium/boron oxidation reactions may proceed in parallel.

The low-temperature atmospheric oxidation of mixtures of titanium with carbon black or boron was studied by the nonisothermal thermographic method with linear heating of the material at a given rate in the apparatus described in [2]. The following powders were used: magnesiothermic titanium TU-10-0, 7-77 of two grades: fine No. 1 (particle size <180 μm) and coarse No. 2 (particle size from 180 to 630 μm), carbon black grade PM-15TS (specific surface $\sim 18\ m^2/g$), and finely dispersed crystalline boron with a purity ~98%. During the experiments we determined the temperature difference ΔT between the blocks with the investigated mixture

Chernogolovka. Translated from Fizika Goreniya i Vzryva, Vol. 20, No. 1, pp. 43–48, January–February, 1984. Original article submitted September 23, 1982.

38 0010-5082/84/2001-0038$08.50

References secured to subscribers.