

## ON BURNING OF MAGNESIUM POWDER WITH WATER

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**Abstract:** An experimental study of combustion of magnesium powder with liquid water and with gelatinous water was carried out. The limits of combustion wave propagation and the velocity of combustion wave in cylindrical charges 10 and 30 mm in diameter were determined, which can reach 3.3 mm/s in mixture with water and 4.5 mm/s in mixture with water thickened with hydrogel at mixture density in charges within 0.6–0.98 g/cm<sup>3</sup>. A new way of intensification of combustion is proposed that allows increasing the amount of water by 10%–18% compared to the combustion of homogeneous mixtures in the charge, in which complete combustion of magnesium is possible without a combustion promoter. It is shown that the degree of chemical conversion of magnesium into reaction products exceeded 85% in almost all experiments. These studies can be useful in creating promising hydrojet and hydrogen-generating charges.

**Keywords:** combustion of mixture of metal powder with water; magnesium; burning rate; degree of conversion; gelatinous water

**DOI:** 10.30826/CE21140207

### Figure Captions

**Figure 1** Scheme of experiments: 1 — sample; 2 — platform; 3 — thermocouples; 4 — spiral for ignition; 5 — oscilloscope; 6 — computer; 7 — movie camera; and 8 — power supply

**Figure 2** Scheme of samples: simple sample (a) and separated sample with one (b) and five (c) cylindrical channels

**Figure 3** Dependence of combustion wave propagation velocity on stoichiometric coefficient in mixtures of magnesium with liquid (1) and gelatinous (2) water at sample diameter 10 (a) and 30 mm (b)

**Figure 4** Degree of conversion of magnesium in the mixture with liquid (empty signs) and gelatinous water (filled signs) with a sample diameter of 10 (1) and 30 mm (2)

### Table Caption

Split charge parameters

### Acknowledgments

The research was performed due to the subsidy given to N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences to implement the state assignment of the topic 0082-2019-0006 “Fundamental studies of conversion processes of energetic materials and development of scientific grounds of controlling these processes” (Registration No. AAAA-A21-121011990037-8).

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*Received February 14, 2021*

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