REACTIVITY OF SILVER AZIDE CRYSTALS IN A SPATIALLY INCREASING MAGNETIC FIELD

E.G. GAZENAUR, L.V. KUZMINA, MEHRUBONI DAVLATALII ABDUNAZAR, N.V. GAZENAUR

Kemerovo State University, Kemerovo, Russia

The use of magnetic field to initiate or stimulate a chemical reaction is especially relevant for highly sensitive materials, such as explosives.

The purpose of this work is to study the main regularities of the decomposition of silver azide crystals in a spatially increasing magnetic field, which can play a significant role in the search for unconventional ways to study of the mechanisms of solid-state reactions [1–3].

To solve the tasks set, the designs of magnetic systems and experimental cells were developed, as well as the optimal conditions for conducting experiments, namely, the field growth rate and exposure time, and the orientation of the crystal faces [4] relative of the lines of the magnetic field. The proposed design makes it possible to observe the release of gaseous decomposition products (nitrogen gas bubbles) during the action of a magnetic field and determine their release rate (outgas sing rate is the total volume of the released gas). The range of magnetic field inductions from 0.01 T to 0.3 T with inhomogeneity of magnetic field from 1.5 to 20 percent was studied.

It has been experimentally shown that in a non-uniform magnetic field, the decomposition reaction of silver azide crystals, which is detected by gas evolution, proceeds more intensively and starts earlier than in a uniform magnetic field, the inhomogeneity of which is not more than 1.5%. As can be seen from the graph in Figure 1, the rate of release of gaseous decomposition products depends on the inhomogeneity of the magnetic field created in the working volume of the magnetic system. The time of gas release is practically independent of the power characteristics of the magnetic field and inhomogeneity of here and is no more than 2 minutes.

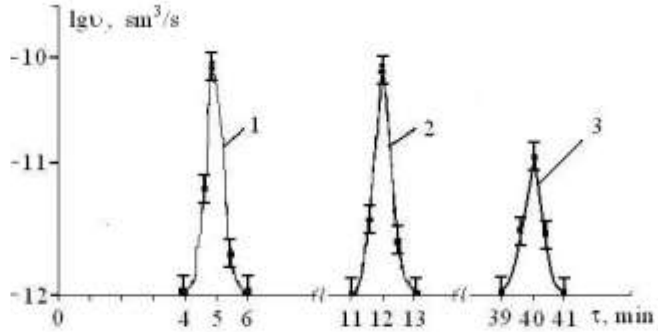

Fig.1. Dependences of the gas release rate in silver azide crystals on the time of exposure to magnetic field (average B=0.3 T) with inhomogeneity of magnetic fields in the working volume: 20% - curve 1; 10% - curve 2; 1.5% - curve 3.

In addition, experimental results show that, in an increasing magnetic field, features of the distribution of gaseous decomposition products over the crystal faces are observed. The gas is released mainly from the side faces of the crystal and partially from the developed face. If compared with the topography of gas release in a uniform magnetic field, it can be noted that the gas is released from the face of the crystal which is perpendicular of to the direction of the magnetic field induction line.

If we talk about the cause of the effect of a spatially growing magnetic field, then we can assume the appearance of an additional component of the Lorentz force, as a activity's result of which positive charge carriers (which are future reagents of a chemical reaction) are concentrated in the region of the crystal, which combined with magnetic field lines of higher density.

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