MICROWAVE DISCHARGE IN A POWDER OF A MIXTURE OF DIELECTRICS, INITIATED BY A DISCHARGE IN NITROGEN [[1]](#footnote-1)\*)

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The possibility of creating a microwave discharge in the pores of a powder mixture of dielectrics and metals was shown in [1]. This type of microwave discharge has a number of specific features (see review [2]). The cellular structure of the discharge creates a highly microwave absorbing medium, which allows one to reach high temperatures both in pores and in dielectric grains. High temperatures (4–7 kK) achieved in the discharge make it possible to initiate high-temperature synthesis reactions in a powder mixture [3–5].

Until now, powders of various dielectrics in mixtures with powders of metals or low-resistance semiconductors have served as objects in which such a cellular discharge could be ignited. This was due to the fact that, at a field strength of 1–8 kV/cm, a discharge appears on the surface in a metal-insulator contact. In [2], it was proposed to use initiation of a gas discharge above the surface of a powder mixture to excite a cellular discharge in dielectrics.

In this work, we used UV radiation of a subthreshold discharge in nitrogen to ignite a cellular discharge in a mixture of boron with melamine (C9H6N6). The experiment was performed in a reactor [6]. At a gyrotron radiation intensity (wave length 4 mm) of 8 kW/cm2 and pulse durations of 4–5 ms in the mode of single pulses or a packet of two pulses with an interval between pulses of 60–80 ms.

Oscillations of the reflected microwave signal made it possible to determine the moments of arrival of the front of the gas discharge on the surface of the powder, the onset of discharge oscillation and the moment of the beginning of intense evaporation.  
In the emission spectra of the discharge, molecular bands corresponding to the bands of the powder material were recorded during the microwave pulses and the continuum spectrum after they ended. It was shown that the temperature in the first pulse reaches 4.3 kK and then drops to 3.9 kK in 6 ms after its end. During the second pulse the temperature was 5.1 kK and 2.85 kK 6 ms after it ended.  
Estimates allow us to conclude that the specific energy input into the powder particles reaches 104–105 J/cm3. This opens up the possibility of using a cellular discharge in powders of various compositions for modeling explosive energy release processes.

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