

USTY PLASMA IN THE MICROWAVE-PLASMA-CHEMICAL COMPLEX SYSTEM

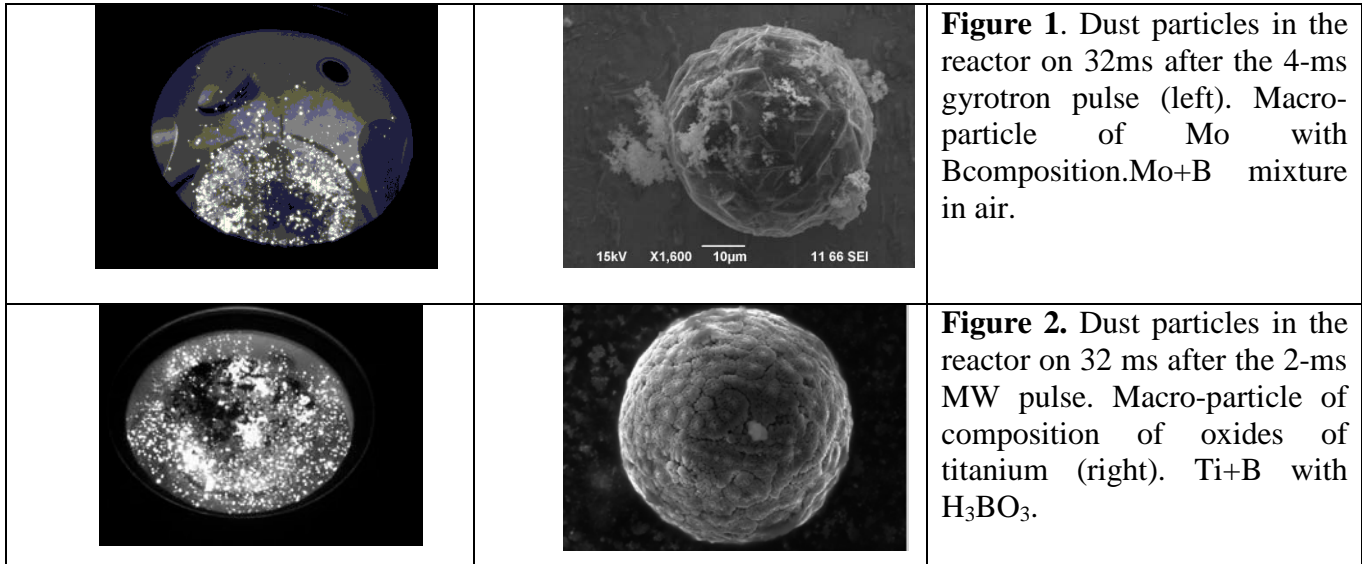
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In this work the dusty plasma arising in chain exothermic reactions initiated by the microwave radiation of a powerful gyrotron in mixtures of powders of a metal and a dielectric was studied as a part of new method for synthesis of micro- and nanostructured composite materials. Dusty plasma was observed in the atmosphere of air for mixtures of different metals (titanium, molybdenum, aluminum, and est.) with boron and boron nitride without and in the presence of small amounts of $C_2B_{10}H_{12}$, $NaBH_4$ and H_3BO_3 as hydrogen sources.

Experiments on dust plasma investigations were made on a special plasma chemical stand with original reactor incorporated into the standard design of the MIG-3 gyrotron complex [1]. In the experiment conditions, the microwave breakdown was followed by free gasdynamic expansion of the powder mixture which created a non-equilibrium plasma-gas-dust medium inside the reactor. Plasma-chemical and exothermic reactions took place under the non-equilibrium conditions of the discharge afterglow leading maintaining the high temperatures of the substances in the reactor [2]. Dust plasma was formed in reactor volume after the switching off the microwave gyrotron pulse. The properties of ensembles of dust particles (tracks, velocities, lifetime, etc.) were measured. It is shown that these charged particles are necessary as the crystallization centers from suspended matter in the creation of composite of substances of microscopic dimensions that arise during secondary plasma-chemical synthesis [3]. The synthesized structures deposited on the impurity particles and on the reactor walls within the reactor. Figures 1 and 2 shows photos of dust particles in the reactor and structures of synthesized substances for two different mixtures of powders of metals and dielectrics.



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References

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