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Steam explosion of thin-walled glass capsules with water

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The results of investigating the possibility of extinguishing of the flames by the steam explosion of hermetically sealed thin-walled capsules filled by water (RF patent № 2295370, 2396602, 2406552, 2401674) are presented. The experiments were performed with a few millimeters size glass capsules: a)spherical (diameter d = 7 mm, wall thickness Δ = 0,23-0,25mm, the volume of water in the capsule of 0.14 ml) and b)cylindrical shape (diameter d = 5 mm , the length of the capsule 45 mm, wall thickness Δ = 0,4-0,5 mm and the volume of water in the capsule 0.3 ml). The capsules were heated by flame of different types gas burners.

Integral picture of the dispersed water cloud after steam explosion of capsule was obtained by the method of high- speed video. Dynamic changes of water temperature until the moment of the explosion was measured by thermocouple. The delay time of the explosion from the heating was a few seconds, the water temperature in the capsule reached 250 ÷ 320°C, respectively, the pressure in the capsule of 5 ÷ 10 MPa.

By recording the angular distribution of scattered laser radiation the size of the dispersed droplets of water was estimated. The results of these measurements the droplet size was 0,3 ÷ 0,4 μ.

In experiments on the interaction with the flame of the dispersed water cloud formed in the explosion of the capsule was obtained, that the flame extinguishing occurs almost instantly at the front of the cloud.

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