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RADIOGRAPHIC RESEARCH OF THE METAL-PUFF PLASMA JETS FORMED BY THE VACUUM ARC DISCHARGE

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Soft x-ray radiography ($\approx 1\div 2$ keV) of a bismuth and aluminum metal-puff plasma formed by the high-current vacuum arc discharge is presented. The plasma gun with the arc current ≈ 60 kA and the current rise time ≈ 7 μ s was used to produce a metal-puff plasma jets. The compact pulsed radiograph XPG-1 (250 kA, 220 ns) with X-pinch and PZ-pinch load was used as a source of the soft X-ray radiation. X-pinch load consisted of four Mo wires with diameter 25 μ m. PZ-pinch load is a miniature plasma jet. Jet length is equal to 1.5 mm. The spatial and temporal parameters of the radiating hot spot of X-pinch and PZ-pinch loads are close to each other. X-ray backlighting images of the researched plasma jet and the Bi step-wedge with a step thickness of ≈ 100 nm were recorded simultaneously at the experiment. The comparison of the plasma jet x-ray image has enabled to estimate the dependencies of the jet linear mass on the arc current. Experiments have shown that when the arc current density reaches $\approx 3\cdot 10^5$ A/cm² the evaporation rate of the electrode material reaches ≈ 100 μ g/ μ s, that under the plasma velocity ≈ 0.5 cm/ μ s provides a plasma jet linear mass ≈ 200 μ g/cm. At a distance of $\approx 1\text{-}2$ mm from the arc cathode surface the sharp increase of jet linear mass (up to ≈ 500 μ g/cm) was occurred.

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