

CHARACTERIZATION OF D.C. PLASMA TORCH VOLTAGE FLUCTUATIONS

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Abstract

The arc root fluctuations at the anode-nozzle of a d.c. plasma spray torch with a special configuration of the electrodes allowing to work with the same gas flowrate with nozzle diameters ranging from 6 to 10 mm were systematically studied. The plasma gas was Ar/H₂ (25 vol % H₂), the current was varied between 200 and 600 A and the plasma gas flowrate between 24 and 80 slm. After 30-60 mn working the nozzle wall started to be sufficiently eroded to have a stagnant arc spot which lived as long as arcing created another one. It was shown that the life time of the upstream arc spots were 30-40 % longer than the downstream ones which could play an important role in the electrode erosion. Dimensional analysis allowed to find a relationship between the nozzle diameter D, the arc current I and gas flow rate G and the mean spot lifetime which is closely connected with the difference between D and the electrical diameter of the arc column. The comparison of voltage signal and light emission at a point of the plasma jet close to the nozzle exit on its axis allowed to determine the mean electrical field within the plasma column and the mean position of the arc root. The comparison with the electrode erosion area for well defined conditions showed a good correlation with the calculated arc root position.