study of high density plasma spray parameters using plasma conxial accelrator

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In the present work, a plasma coaxial system is used with a new idea of studying the deposition applications using different powders(graphite and ceramic) to get a thin film of the deposited material.The electrical properties of the coaxial plasma system showed that, the peak current reached about 8.2 kA after 15 gs for 3 kV charging voltage. The total system inductance and resistance are 1.97 RH and 36.87 mil , respectivelly. It has been shown that the discharge power flows from the capacitance in the positive direction while the power flows from the inductance in the opposite direction. The peak power achieved at 3 kV charging voltage was 10.37 MW.The plasma inductance measurements showed that it has a peak values of 2.82 pH, 2.74 pH, 2.59 gH and 2.22 gHat discharge time 12 Its, 44 gs, 76 ps and 104 ps, respectively. These represent the time at which the plasma current sheath reached the muzzle.It has been observed that the plasma resistance has minimum values of 12.05 mil, 19.77 mil, 3.98 mil and 1.22 mfg at discharge time 28 gs, 56 gs, 96 ps and 112 ps, respectively. These minimum values represent the complete formation of the plasma sheath current at that time.The plasma parameters such as the electron temperature and plasma density are measured using double electric probe and equal to 3 eV and 2.25 x 1013 ion/cm3 , respectively. The plasma sheath velocity measured by magnetic probe is found inthe order of /04 m/s. Il has been Found that the total computed system efficiency was equal to 10.9’% .A theoretical consideration is made and the relations between the discharge time, the theoretical velocity and the theoretical position from the breaching end are plotted.For the deposited material study, the scanning electron microscope (SEM) analysis and suitable arrangement of laser interferometer are used.The study of the ceramic and graphite powders using SEM analysis shows the presence of a homogeneous distribution of the deposited material. It has been found that the grains follow Maxwellian distribution for the density of size distribution where the grains diameters are of a range between 0.15 gm and 3.6 j.tm . It is also seen that for the graphite, a diamond crystals or diamondlike carbon (DLC) films may be formed with small ratio.The study of the deposited material thickness using the laser interferometer arrangement showed a linear dependence of the deposited material thickness with number of pulses and exponential one with the charging energy.