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Characterization of an electron beam generated in the pulsed plasma deposition gun DMITRY YARMOLICH, Organic Spintronics srl, PETER NOZAR, CARLO TALIANI, per lo Studio dei Materiali Nanostrutturati, SVETLANA GLEIZER, YAKOV KRASIK, Technion — The channel spark discharge was used as a high-current density (up to 30 kA/cm^2) relatively low energy (<20 keV) electron source in a pulsed plasma deposition (PPD) gun. Due to a high energy density deposition, the PPD gun can be applied for the deposition of thin films by pulsed ablation of different target materials, at a background gas pressure in the range $10^{-2} - 10^{-4}$ Torr. Parameters of the electron beam generated in a modified PPD gun were studied using electrical, optical, and x-ray diagnostics. It was found that the plasma formation between the gun output and target that restricts the energy delivering to the electron beam. It was shown that efficient (up to ∼74%) transfer of the initially stored energy to the energetic electron beam is realized at the background gas pressure of 10^{-4} Torr. Conversely, at a pressure of 10^{-3} Torr, only ≤10% of the stored energy are acquired by the energetic electrons. It was shown that the modified PPD gun, due to extremely high energy density at the target delivered by the electrons, may be applied for the deposition of different materials. The deposition rates and properties of the deposited films (DLC, ZnO, TiO2, W, CdTe, CdS) are discussed as well.

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