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Model of an Ar/O_2 inductive discharge used for plasma spray deposition CLAUDIA LAZZARONI, MEHRDAD NIKRAVECH, LSPM, CNRS UPR 3407, Université Paris 13, PASCAL CHABERT, LPP, CNRS, Ecole Polytechnique, UPMC, Paris XI — A global model of a low pressure radio-frequency inductive discharge proposed to deposit thin layers of zinc oxide, the so-called spray-plasma device, is presented. This device consists in the injection of a precursor in the plasma reactor which is fed with an admixture of argon and oxygen and where the pressure is typically several tens of mTorr. This precursor is an aqueous solution of zinc nitrates, chlorates or acetates, which is transformed into an aerosol thanks to an ultrasonic sprayer. The droplets are then injected in the reactor through an aerosol conditioner and the ZnO layer is deposited on the substrate holder. The global model is based on the numerical resolution of the particle balance equations and the power balance equation. The model is run until the steady state is reached and we obtain the plasma parameters that are the species densities and the electron temperature. A parametric study is done varying the gas pressure, the RF power and the O_2 fraction in the reactor. Throughout the range investigated the electron density is found to be several 10^{17} m^{-3} and the electron temperature is between 2 and 3 eV. A great importance parameter for the deposition process is the flux of the reactive species (O, O^+, O_2^+) on the substrate holder and the model allows a fast parameter range exploration.

Claudia Lazzaroni
LSPM, CNRS UPR 3407, Université Paris 13

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