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Global model of an arc discharge plasma for nanoparticle synthesis[1] SERGEY AVERKIN, Tech-X Corporation, University of Colorado Boulder, THOMAS JENKINS, MADHUSUDHAN KUNDRAPU, Tech-X Corporation — Global models have become an invaluable tool for quick estimates of plasma parameters such as volume-averaged number densities of plasma components or electron temperature in gas discharge plasmas. However, these estimates are a crude approximation of the plasma properties and do not contain any information regarding spatial distributions. We present a novel formulation of global model equations that allows the prediction of plasma parameters not only qualitatively (as is the case in conventional global models) but also quantitatively. In this model we choose a general functional representation of plasma properties and substitute it into fluid equations. Then we minimize the L^2 norm of the resulting equations and solve a system of algebraic equations for unknown parameters in the general functional representation. The model is applied to a 1D arc discharge that is used in nanoparticle synthesis, and which was recently analyzed numerically and analytically by Khrabry et al. (2018).

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