

Abstract Submitted
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The influence of additional ballast volume on pulsed ICP discharge plasma parameters.¹ V.I. DEMIDOV, WVU, C.A. DEJOSEPH, JR, AFRL, E.A. BOGDANOV, A.A. KUDRYAVTSEV, K.YU. SERDITOV, SPbU — An analysis of plasmachemical reactor parameters has been performed for the case of a small discharge volume connected to a much larger diffusion chamber (see, for example, V. I. Demidov et al., Phys. Rev. Lett., v.95, 215002, 2005) for both the active and afterglow phase of the discharge. During the active phase, plasma is formed primarily in the smaller volume and the large ballast volume has a comparatively low charged particle density. As a result, the ballast volume has little effect on the plasma parameters in the discharge chamber. However, in the afterglow phase the situation changes markedly. This is a result of the significantly different diffusion-loss times between the two volumes. Due to the rapid decrease in electron density in the smaller discharge volume, the density becomes less than in the ballast volume. Therefore, during the afterglow phase, the axial component of the gradient in the plasma density changes sign as does the axial component of the ambipolar field. The large volume plays a thermostatic role and significantly affects plasma parameters and transport processes in the small volume. This leads to a number of effects, in particular to a much slower degradation of the electron density and temperature in discharge volume, and to the rate of change of charged particles densities.

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