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Mechanism of N_2 Dissociation and Kinetics of N(^{4}S) Atoms in Pure Nitrogen Plasma[1] ANDREY VOLYNETS, Lomonosov Moscow State University, Faculty of Physics, DMITRY LOPAEV, NIKOLAY POPOV, Lomonosov Moscow State University Skobeltsyn Institute of Nuclear Physics — This work deals with kinetics of the ground state nitrogen atoms N(^{4}S) and N_2 dissociation mechanism in pure N_2 plasma. The experiment was carried out in positive column of DC glow discharge for p=5-50Torr, J=20-100mA. N(^{4}S) balance was considered for spatially uniform conditions controlled by only two terms: source (characterized by effective production rate k_{eff}) and loss (characterized by effective loss time τ_{loss}). Analysis of k_{eff} and τ_{loss} gains considerably better understanding of N_2 dissociation. N/N_2 dissociation rate as function of discharge parameters was obtained using two independent optical methods: actinometry on Ar atoms and $N_2$2+ band emission decay at discharge modulation. With N/N_2 radial profiles N atom surface loss probability γ_N and then τ_{loss}were estimated. γ_N revealed to be dependent on N(^{4}S) concentration and thereby discharge conditions through the sorption balance of physisorbed N atoms. Phenomenological model taking into account basic surface processes provides γ_N data in good agreement with experiment. Finally, k_{eff} was obtained as function of E/N and it was shown that even EEDF calculated with accounting for N_2 vibrational excitation is unable to provide observed values of k_{eff}. Reasons of that fact are discussed in detail.

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