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Modeling of non-equilibrium and non-thermal plasma discharge in air: Three temperature modeling approach[1] RAJIB MAHAMUD, TANVIR FAROUK, Department of Mechanical Engineering, University of South Carolina — The rapid progress in atmospheric pressure non-thermal plasma discharge has made air to be a preferable choice for feed gas. Despite the ease of operation of such discharges in air, the preference of air provides added complexity to modeling and simulations in terms of kinetics and different temperature modes. The diatomic nature of both N_2 and O_2 contributes to this complexity. In this work we report simulation results from a one-dimensional multi-physics model. A dc driven air plasma discharge operating at atmospheric and higher pressure is simulated. The model considers 50 species and 200 elementary reactions. The reaction scheme considers electron introduced and heavy particle reactions for N_2 and O_2 as well as interactions between nitrogen and oxygen. In addition to the species conservation equations, poisson's equation three different temperature's are resolved - electron, vibrational and translational. A special focus has been the coupling between the different temperatures to accurately resolve the energy cascade. The predictions from the model are found to be in good qualitative agreement against experimental measurements available in the literature.

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