Abstract Submitted
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Controlling Vibrational Excitation in Atmospheric Pressure Nitrogen Discharges[1] HELEN DAVIES, University of York, ANDREW GIBSON, Ruhr-University Bochum, MARJAN VAN DER WOUDE, TIMO GANS, DEBORAH O'CONNELL, University of York — The influence of vibrational states is well-documented in low pressure nitrogen systems, in particular their role in nitrogen dissociation and ionisation, as well as mediating the appearance of the Nitrogen Pink Afterglow. However, their importance in atmospheric pressure discharges has generally been studied in less detail. Here, a 0D global model was used to investigate the effects of different plasma operating conditions on the vibrational excitation in simulated, pulsed, atmospheric pressure nitrogen plasmas. Power and frequency variations revealed that increasing energy input increases the population of vibrationally excited states in the plasma, allowing them to play important roles in the plasma chemistry, in particular with respect to metastable production. It is also shown that above a certain threshold of energy input, vibrational states act to store and redistribute energy in the system through vibration-vibration collisions. This occurs in a manner that is independent of whether this energy is input through a higher frequency or power, as long as the total energy is above the required threshold. Overall this work aids the understanding of atmospheric pressure chemical kinetics in nitrogen, and allows insights into potential tailoring of plasmas for applications.

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