Kinetic Modeling of Electron Loss Kinetics in high pressure O_2/N_2 Electron Beam Sustained Plasmas KRAIG FREDERICKSON, WALTER LEMPERT, Ohio State University — Previous work has demonstrated that the effective rate of electron loss by three-body attachment in O_2 containing plasmas is significantly decreased in vibrationally excited nonequilibrium environments, an effect which has been attributed to an increased rate for the electron detachment pathway. Specifically it is postulated that the rate of detachment is greatly enhanced by the presence of vibrationally excited "rapid detacher" species, since in a collision between O_2^- and a molecule possessing two or more quanta of vibrational energy the low electron affinity of O_2 ($\sim$0.43eV) is exceeded. Assuming that the detachment cross section for such collisions is approximately gas kinetic, modeling indicates that the calculated effective electron detachment rate is nearly equal to or in excess of the experimentally determined net electron attachment rate. Analysis of the vibrational level populations indicates that in the nonequilibrium environment created in this study there is sufficient population in the vibrational levels responsible for detachment to account for the observed 5-6 order of magnitude increase in the effective detachment rate.

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