CHEMILUMINESCENT REACTIONS OF OXYGEN-IODINE SYSTEMS

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The reactions of O atoms with iodine containing molecules and the kinetics of the IO radical are of relevance to the removal of tropospheric ozone. These reactions, along with energy transfer processes involving electronically excited states of O_2, are also relevant to a new class of oxygen-iodine lasers that employ discharge excitation.

Pulsed photolysis of $CF_3I/N_2O/N_2$ mixtures and direct laser excitation of O_2 in the presence of I_2 have been used to investigate the iodine oxygen kinetics. The primary findings of this study are that $O_2(a^1\Delta)$ is generated by the reactions IO+O→I+O_2(a) and I+I+O_2→I_2+O_2(a). O_2(b) and O_2(a) are removed by I_2 with rate constants of $5.8\text{x}10^{-11} and < 5\text{x}10^{-16}$ cm^3 s^{-1}, respectively. The branching fraction for the physical quenching channel O_2(b)+I_2→O_2(a)+I_2 was found to be 0.4. Re-measurement of the rate constant for O_2(a)+O_2(X)→2O_2(X) yields a value of $9.3\text{x}10^{-19}$ cm^3 s^{-1}. This result is somewhat lower than previous estimates.