MEASUREMENT OF THE RATE CONSTANT FOR QUENCHING OF $I(^2P_{1/2})$ BY $O_2(X)$ AT 150K

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The upper level of the chemical oxygen iodine laser (COIL) is pumped by the energy transfer process

$$I(^2P_{3/2})+O_2(a^1\Delta_g)\Leftrightarrow I(^2P_{1/2})+O_2(X^3\Sigma^-_g)$$

Current COIL devices operate under supersonic expansion conditions with a calculated local temperature of 150K. In order to successfully model the laser both the forward and backward rate constants of this energy transfer process must be known at 150K. Therefore, we have measured the rate constant for quenching of $I(^2P_{1/2})$ by $O_2(X^3\Sigma^-_g)$ in a Laval nozzle expansion. The result obtained suggests a rate constant that is appreciably smaller than that used in current models. Methods used to measure the quenching rate constant have also allowed us to measure the rate constants for energy transfer between the F=3 and F=2 hyperfine levels of $I(^2P_{1/2})$. Results will be presented and discussed in relationship to recently calculated potential energy surfaces for IO_2.