KINETIC SPECTROSCOPY OF NCl[a]

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Metastable NCl($a^1\Delta$) is a promising energy carrier for use in chemically driven iodine lasers. The present studies of NCl kinetics were conducted in support of efforts to develop an NCl(a)/I laser system.
Photolysis of N_3Cl was used to generate NCl for spectroscopic and kinetic measurements. The kinetics of NCl in the ground and excited electronic states was studied by means of time-resolved direct absorption and emission measurements. Rate constants for removal of NCl(a) by O_2, H_2, Cl_2, I_2, ClN_3 and self-annihilation (NCl(a)+NCl(a)) were determined.
The reaction of NCl(a) with I_2 and energy transfer from NCl(a) to I were examined using photolysis of N_3Cl/I_2 and N_3Cl/CH_2I_2 mixtures, respectively. Time-resolved fluorescence from I^* was used to follow the reaction and transfer kinetics. Kinetic models were developed to simulate the I^* time histories. The models, which were anchored by the NCl removal rate constants, were used to explore the kinetics of secondary photoproducts. The relevance of the results to NCl/I transfer lasers will be discussed.

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