

## KINETIC SPECTROSCOPY OF NCl<sup>a</sup>

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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<sub>3</sub>Cl 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<sub>2</sub>, H<sub>2</sub>, Cl<sub>2</sub>, I<sub>2</sub>, ClN<sub>3</sub> and self-annihilation (NCl(a)+NCl(a)) were determined.

The reaction of NCl(a) with I<sub>2</sub> and energy transfer from NCl(a) to I were examined using photolysis of N<sub>3</sub>Cl/I<sub>2</sub> and N<sub>3</sub>Cl/CH<sub>2</sub>I<sub>2</sub> 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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<sup>a</sup>Work supported by Air Force Office of Scientific Research.