KINETIC SPECTROSCOPY OF THE NCl $b^1\Sigma^+$–$X^3\Sigma^-$ TRANSITION[a]

ANATOLY V. KOMISSAROV, MICHAEL. C. HEAVEN, *Department of Chemistry, Emory University, Atlanta, GA 30322* ; STEVE J. DAVIS, *Physical Science Inc. 20 New England Business Center, Andover, MA 01810*; and GERRY C. MANKE II, *Air Force Research Laboratory, Kirtland AFB, NM 87117*.

Renewed interest in the low-lying metastable electronic states of NCl has been generated by the realization that NCl($a^1\Delta$) may be used as energy carrier in chemical laser devices[a]. In order to characterize the conditions within a device (local temperature, pressure and concentration) we are currently developing spectroscopic diagnostics based on direct absorption measurements of NCl $b^1\Sigma^+$–$X^3\Sigma^-$ transition.

We report studies of the $b^1\Sigma^+$–$X^3\Sigma^-$ system using photolitic generation of NCl, combined with long-path absorption measurements. A CW ring dye laser was used to obtain high resolution (Doppler limited) spectra. Branching ratios for $N_3Cl + h\nu \longrightarrow NCl(X^3\Sigma^-/a^1\Delta) + N_2$ were determined for 193 and 248 nm photolysis. Time-resolved measurements provided information about NCl energy transfer and reaction kinetics. The relevance of the results to NCl($a^1\Delta$)/I transfer lasers will be discussed.

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