Fourier Transform Spectroscopy Study of Fully Mixed $A^1\Sigma^+$ and $b^3\Pi$ States of KCs Molecule

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The fully mixed $A^1\Sigma^+ \sim b^3\Pi$ complex of the KCs molecule was studied with laser induced fluorescence A-b $\rightarrow X^1\Sigma^+$ spectra Fourier-transform spectrometry (FTS). Present research is a continuation of the recently performed studies of the $A^1\Sigma^+ \sim b^3\Pi$ complex in the NaRb [1] and NaCs [2] molecules, where high accuracy FTS data have been reproduced with an experimental accuracy by a direct deperturbation analysis by means of the inverted channel-coupling approach with Hund's *a*-coupling case basic functions. The $A^1\Sigma^+ \sim b^3\Pi$ complex in KCs can be considered as fully mixed system due to very strong spin-orbit interaction.

Direct optical excitation of the KCs $A^1\Sigma^+ \sim b^3\Pi$ complex in a heat-pipe was performed by the diode lasers. Three laser diodes 850 nm, 980 nm and 1020 nm were used with the respective laser frequency tuning ranges 11943 -11550 cm^{-1}, 10515 – 10209 cm^{-1}, and 9940-9700 cm^{-1}. Spectra analysis and determination of the upper state energies was based on the accurate experimental ground state potential energy curve [3]. The laser induced fluorescence spectra typically contained rich collisionally induced rotational relaxation line structure. The analysis of rotational satellites has enlarged the data set of A-b complex rovibronic term values significantly. Currently more than 2200 rovibronic term values have been obtained, including the data on the predominantly $A^1\Sigma^+$ state covering vibrational level v values from $v = 0$ to about 50 and rotational levels J from $J = 9$ to 210, as well as term values data of the predominantly $b^3\Pi_0$ state. We estimate experimental term values uncertainty as 0.01 cm^{-1}.

The experimental term values will be processed by a direct channel-coupling deperturbation approach in order to refine the potential electronic curves of the $A^1\Sigma^+$ and $b^3\Pi$ states of KCs and the spin-orbit coupling functions on the internuclear distance which would reproduce the experimental termvalues and fluorescence intensity distributions within an accuracy of the measurements. Work is in progress.

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