ANALYSIS OF STRONGLY PERTURBED $1\,^1\Pi - 2\,^3\Sigma^+ - b\,^3\Pi$ STATES OF THE KRb MOLECULE

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An important goal of recent ultracold molecule research is to produce molecules in the lowest rovibronic state, $v'' = 0$, $J'' = 0$, of the $X\,^1\Sigma^+$ ground electronic state. Here, stimulated Raman transfer pathways to the lowest rovibronic state through strongly perturbed intermediate levels, starting from the $a\,^3\Sigma^+$ state, are determined by observing the intermediate states using a combination of molecular beam and ultracold molecule experiments. By using such spectra, the vibrational levels of strongly perturbed states such as the $1\,^1\Pi - 2\,^3\Sigma^+ - b\,^3\Pi$ states could be rapidly assigned. Vibrational assignments for the $1\,^1\Pi$ state match well with those of Kasahara, *et al.*[a] Several $\Omega = 0^-$ and 2 levels of the $2\,^3\Sigma^+$ and $b\,^3\Pi$ states, all of which are forbidden from the $X\,^1\Sigma^+$ state, were observed and assigned. This new spectroscopic combination allows one to unravel complex and highly perturbed spectra and determine optimal routes for stimulated Raman transfer of molecules formed near dissociation by photoassociation or magnetoassociation to the lowest rovibronic levels of the $X\,^1\Sigma^+$ ground electronic state.

[a] N. Okada, S. Kasahara, T. Ebi, M. Baba and H. Kato, *J. Chem. Phys.* **105**, 3458 (1996); S. Kasahara, C. Fujiwara, N. Okada, and H. Kato, *J. Chem. Phys.* **111**, 8857 (1999).