SPECTROSCOPIC ANALYSIS OF THE A AND 3 $^1\Sigma^+$ STATES OF ^{39}K^{85}Rb

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The vibrational levels of the mutually strongly perturbed 1 $^1\Pi$ – 2 $^3\Sigma^+$ – b $^3\Pi$ states of ^{39}K^{85}Rb[a] were previously assigned by using a combination of molecular beam and ultracold molecule (UM) excitation spectra, the latter generated from levels of the a $^3\Sigma^+$ state formed following photoassociation to a level of the 3(0^-) state. In a follow-on study using the same techniques, we have now successfully assigned high vibrational levels of the A and 3 $^1\Sigma^+$ states from the excitation spectra of UMs formed by PA to both 3(0^+) and 3(0^-) levels. The $^1\Sigma^+$ states are absent in the UM spectra for levels formed by the 3(0^-) PA level. This absence has been explained by considering Hund's case (c) selection rules and the transition dipole moment calculations by Kotochigova $et\ al.$[b] between the upper excited A $^1\Sigma^+$(2(0^+)) state and the three Ω components at the ground state dissociation limit. This work is supported by NRF in Korea (Grant 2009-0085319 at Chosun and Grants 2011-0001335 and 2011-0020419 at KAIST) and by NSF (Grant PHY-0855613) and AFOSR (Grant MURI FA9550-09-1-588) in the US.

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