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Spectroscopic investigation of the A and 3 $^1\Sigma^+$ states of ^{39}K^{85}Rb
JIN-TAE KIM, Dept. of Photonic Eng., Chosun Univ., Korea, YONGHOON LEE, Dept. of Chemistry, Mokpo National Univ., Korea, BONGSOO KIM, Dept. of Chemistry, KAIST, Korea, DAJUN WANG, PHILLIP GOULD, EDWARD EYLER, WILLIAM STWALLEY, Dept. of Physics, Univ. of Connecticut, USA — We have explored the absorption spectra of ultracold ^{39}K^{85}Rb molecules in the region 11,000-12,000 cm^{-1} above the ground state dissociation limit, formed by radiative decay following photoassociation(PA) to either the 3(0^+) or the 3(0^-) state. Recently we have reported that molecules formed by using the 3(0^-) PA level are not excited to the A and 3 $^1\Sigma^+$ states, but rather the 1 $^1\Pi$, 2 $^3\Sigma^+$, and b $^3\Pi$ states. However, we have observed high vibrational levels of these $^1\Sigma^+$states by using the 3(0^+) level for PA. The absence of the $^1\Sigma^+$ states in the spectra from levels formed by the 3(0^-) PA level has been explained by considering Hund's case (c) selection rules and the transition dipole moment calculations by Kotochigova *et al.*[1] between the upper excited A $^1\Sigma^+$(2(0^+)) state and the three Ω components at the ground state dissociation limit. Unexpectedly, many high vibrational levels(v$\prime$=26-52) of the 3 $^1\Sigma^+$ state, with a small transition dipole moment from the 1(0^+) state[1], have also been observed. The observed energies of the v$\prime$=26-44 levels match well with those observed from molecular beam experiments. Thus we have fully analyzed the ^{39}K^{85}Rb electronic states in the entire region 11,000-12,000 cm^{-1} above the ground state dissociation limit.

[1]. S. Kotochigova, E. Tiesinga, and P. S. Julienne, Phys. Rev. A **68**, 022501 (2003). This work is supported by NSF and AFOSR.

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