LASER-INDUCED-FLUORESCENCE EXCITATION AND EMISSION SPECTRA OF THE $1\,^3\Sigma_u^+$–$1\,^3\Pi_g$ ($1\,^3\Sigma^+$–$2\,^3\Pi$) TRANSITION IN K_2, Rb_2 (KRb) ON THE SURFACE OF SUPERFLUID HELIUM DROPLETS

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We measured laser induced fluorescence and emission spectra of the $1\,^3\Sigma_u^+(0_u^-, 1_u)$–$1\,^3\Pi_g(0_g^+, 0_g^-, 1_g, 2_g)$ transition of K_2, Rb_2, and the corresponding $1\,^3\Sigma^+(0^-, 1)$–$2\,^3\Pi(0^+, 0^-, 1, 2)$ transition of KRb, on the surface of superfluid helium droplets. The spectra are relatively well explained, quantitatively, by simulations making use of the gas phase potentials.[ab] For an exact agreement, however, one needs to assume: (1) that the $1 \leftarrow 0^-$ excitation is strongly suppressed, (2) that the spin-orbit coupling constant is increased (K_2, KRb), and (3) an adjustable broadening factor. (1) points to a yet-unexplained lack of population of the 0^- state after dimer formation, (2) and (3) can be justified qualitatively as due to the presence of the droplet, but are difficult to predict quantitatively. Data analysis is in progress. Emission spectra, sharp, confirm that the molecules emit from the gas phase after having been ejected from the droplet; they can be used to test existing potential energy surfaces. We are in the process of acquiring new data and improving our analysis of vibrational populations in the excited state.[c]

[a] K_2: A. R. Allouche. Potential energy curves available at lasim.univ-lyon1.fr/allouche/pec.html

[b] Rb_2, KRb: M. Aymar and O. Dulieu private communication

[c] J. Nagl, G. Auböck, C. Callegari, and W. E. Ernst, paper TC05, 60th OSU Symposium on Molecular Spectroscopy, 2005