SPECTROSCOPY OF LiCa AND RbSr MOLECULES ON HELIUM NANODROPLETS

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We report on the investigation of mixed alkali metal (Ak) - alkaline earth metal (Ake) molecules on the surface of helium nanodroplets (Heₙ). These molecules have recently attracted considerable attention as candidates for the formation of ultracold molecules with a magnetic and an electronic dipole moment. In our experiments, LiCa and RbSr molecules are formed in a sequential pick-up process in their $^2\Sigma^+$ ground state and cool down rapidly to the droplet temperature of 0.38 K. Excitation spectra of LiCa and RbSr were recorded by using resonance enhanced multi-photon ionization time-of-flight (REMPI-TOF) spectroscopy and laser induced fluorescence (LIF) spectroscopy. On the helium droplet, vibronic transitions in Ak-Ake molecules are broadened and show a characteristic asymmetric peak form, which is caused by the interaction between the molecule and the superfluid Heₙ environment. For the lower electronic transitions in LiCa and RbSr progressions of vibrational bands excited from the $^2\Sigma^+$ ($\nu'' = 0$) state are observed. The LiCa spectra can be compared to molecular beam experiments, which enables the assignment of three band systems near 15260 cm⁻¹, 19300 cm⁻¹ and 22120 cm⁻¹ as $^2\Sigma^+$, $^2\Pi_{\Omega}$ and $^2\Pi$ band, respectively. In the RbSr excitation spectrum we observe a vibrationally resolved band system near 14020 cm⁻¹.

Upon electronic excitation, a fraction of the molecules desorb from the droplet surface and dispersed fluorescence spectra allow to study the $^2\Sigma^+$ ground state and excited states of free Ak-Ake molecules.

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