AN ANALYTIC POTENTIAL ENERGY CURVE FOR THE $a\,^3\Sigma^+$ STATE OF KLi, DERIVED FROM OBSERVATIONS OF THE UPPER VIBRATIONAL LEVELS ONLY

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Fourier transform resolved fluorescence spectra of the ^{39}K^{6}Li molecule have been recorded in the near-infrared, following laser excitation (Coumarin 6 dye) to high vibrational levels of the $B\,^1\Pi$ state. The FT spectra show transitions to high vibrational levels of both the $X\,^1\Sigma^+$ and $a\,^3\Sigma^+$ electronic states. These include 147 transitions into six vibrational levels of the $a\,^3\Sigma^+$ state, which lie between 7 and 88 cm^{-1} below the dissociation asymptote. Unfortunately, their energies span less than 30% of the total ground-triplet-state well depth, and even vibrational assignment is not immediately obvious. However, fitting those data to eigenvalues of analytical model potential functions whose outer limbs incorporate the theoretically predicted long-range form, $V(R) \simeq D - C_6/R^6 - C_8/R^8$, yields complete, plausible potential curves for this state. The best fits converge to remarkably similar solutions which strongly suggest that the lowest observed level is v=5. Equilibrium parameters from these fits indicate $D_e = 287(\pm 4)$ cm^{-1} and $R_e = 4.99(\pm 0.09)$ Å for the $a\,^3\Sigma^+$ state of KLi, with $\omega_e = 47.3(\pm 1.5)$ and $44.2(\pm 1.5)$ cm^{-1} for ^{39}K^{6}Li and ^{39}K^{7}Li, respectively. Properties of the resulting potential are compared with those of an *ab initio* potential and with those of the analogous states of Li_2, K_2, Na_2 and NaK. The optimized potential curve predicts that the last bound level of both isotopologues lies less than 0.002 cm^{-1} below the atomic asymptote, but since these binding energies are much smaller than the current uncertainty in the ground state dissociation energy (± 0.07 cm^{-1}), they remain subject to caution.