DETERMINATION OF THE POTENTIAL ENERGY CURVE OF THE $D\,^1\Pi$ STATE OF NaK BY TWO-COLOR POLARIZATION LABELING SPECTROSCOPY

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Two-colour polarization labeling experiments measuring the $D \leftarrow X$ system of NaK have furnished observations of the D $^1\Pi$ state of NaK up to v" = 42. The last observed level is located 7 cm^{-1} below the Na(3p $^2P_{3/2}$) + K(4s) atomic asymptote, clearly indicating the dissociation products of this state. The vibrational progressions all exhibit irregular intervals, predominantly because of strong interactions with the nearby d $^3\Pi$ state, which also dissociates to Na(3p) + K(4s) atoms. The polarization data have been combined with some resolved fluorescence $D \rightarrow X$ transitions, and analyzed by fitting to spectroscopic parameters and to an analytical potential curve. A full deperturbation treatment has not been attempted, but a "robust" weighting scheme has been used to reduce the influence of levels that cannot be properly represented by a single channel model. Parameters determined in a fit to a potential curve include T_e = 20090.15 ± 0.02 cm^{-1}, D_e = 2157.0 ± 0.3 cm^{-1}, R_e = 4.155 ± 0.002 Å, with an unweighted root mean square error of 0.12 cm^{-1} for 959 data.