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Rotationally inelastic collisions of He and Ar with NaK: Experiment and theory[1] R.F. MALENDA, J. JONES, C. FAUST, K. RICHTER, C.M. WOLFE, A.P. HICKMAN, J. HUENNEKENS, Lehigh University, D. TALBI, F. GATTI, Universite Montpellier II — We are investigating collisions of the ground ($X^1\Sigma^+$) and first excited ($A^1\Sigma^+$) electronic states of NaK using both experimental and theoretical methods. Potential surfaces for HeNaK (fixed NaK bond length) are used for coupled channel calculations of cross sections for rotational energy transfer and also for collisional transfer of orientation and alignment. Additional calculations use the MCTDH wavepacket method. The measurements of the A state collisions involve a pump–probe excitation scheme using polarization labeling and laser-induced fluorescence spectroscopy. The pump excites a particular ro-vibrational level (v, J) of the A state from the X state, and the probe laser is scanned over various transitions to the $3^1\Pi$ state. In addition to strong direct transitions, weak satellite lines are observed that arise from collisionally-induced transitions from the (v, J) level to $(v, J' = J + \Delta J)$. This method provides information about the cross sections for transfer of population and orientation for A state levels, and it can be adapted to transitions starting in the X state. For the A state we observe a strong $\Delta J =$ even propensity for both He and Ar perturbers. Preliminary results for the X state do not show this propensity.

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