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Polarization Spectroscopy and Collisions in NaK[1] C.M. WOLFE, S. ASHMAN, J. HUENNEKENS, Lehigh U., B. BESER, J. BAI, A.M. LYYRA, Temple U. — We report current work to study transfer of population and orientation in collisions of NaK molecules with argon and potassium atoms using polarization labeling (PL) and laser-induced fluorescence (LIF) spectroscopy. In the PL experiment, a circularly polarized pump laser excites a specific NaK $A^1\Sigma^+(v{=}16,\ J) \leftarrow X^1\Sigma^+(v{=}0,\ J \pm 1)$ transition, creating an orientation (non-uniform M_J level distribution) in both levels. The linear polarized probe laser is scanned over various $3^1\Pi(v{=}8,\ J' \pm 1) \leftarrow A^1\Sigma^+(v{=}16,\ J')$ transitions. The probe laser passes through a crossed linear polarizer before detection, and signal is recorded if the probe laser polarization has been modified by the vapor (which occurs when it comes into resonance with an oriented level). In addition to strong direct transitions ($J' = J$), we also observe weak collisional satellite lines ($J' = J \pm n$ with $n = 1, 2, 3, ...$) indicating that orientation is transferred to adjacent rotational levels during a collision. An LIF experiment (with linear polarized pump and probe beams) gives information on the collisional transfer of population. From these data, cross sections for both processes can be determined. We experimentally distinguish collisions of NaK with argon atoms from collisions with alkali atoms.

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C. M. Wolfe
Lehigh U.

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