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Collisional Transfer of Population and Orientation in NaK[1] C.M. WOLFE, S. ASHMAN, J. HUENNEKENS, Lehigh University, B. BESER, J. BAI, A.M. LYYRA, Temple University — 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 linearly polarized probe laser is scanned over various $3^1\Pi(v,\ J'\pm 1) \leftarrow A^1\Sigma^+(v'=16,\ J')$ 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). Using both spectroscopic methods, analysis of weak collisional satellite lines adjacent to these directly populated lines, as a function of argon buffer gas pressure and cell temperature, allows us to discern separately the effects collisions with argon atoms and potassium atoms have on the population and orientation of the molecule. In addition, code has been written which provides a theoretical analysis of the process, through a solution of the density matrix equations of motion for the system.

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Christopher Wolfe
Lehigh University

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