

Abstract Submitted
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Collisional X - and A -State Kinetics of CN using Transient sub-Doppler Hole Burning¹ MICHAEL HAUSE, TREVOR SEARS, GREGORY HALL — We examine the collisional kinetics of the CN radical using transient hole-burning and saturation recovery. Narrow velocity groups of individual hyperfine levels in CN are depleted ($X^2\Sigma^+$) and excited ($A^2\Pi_i$) with a saturation laser, and probed by a counterpropagating, frequency modulated probe beam. Recovery of the unsaturated absorption is recorded following abrupt termination of an electro optically switched pulse of saturation light. Pressure-dependent recovery kinetics are measured for precursors, NCCN and CH₃COCN, and buffer gases, He, Ar and N₂. In the case of NCCN, similar recovery kinetics are observed for two-level saturation resonances, where the signal observed is a combination of X - and A -state kinetics, as well as for three-level crossover resonances, which can be chosen to probe selectively the hole-filling in the X state or the decay of velocity-selected A state radicals. However in the case of CH₃COCN, the X -state kinetics are faster than the A -state due to an efficient dipole-dipole rotational energy transfer mechanism. The observed recovery rates are 2-3 times faster than the estimated rotationally inelastic contribution and are a combination of inelastic and velocity-changing elastic collisions.

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