POLARIZATION DEPENDENT DYNAMICS OF CO_2 TRAPPED IN AN OPTICAL CENTRIFUGE

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An optical centrifuge (Yuan *et al*. *PNAS* 2011, 108, 6872) has been employed to prepare carbon dioxide molecules in very high rotational states ("hot" rotors, $J \sim 220$) in order to investigate how collisions relax ensembles of molecules with an overall angular momentum that is spatially oriented. We have performed polarization-dependent high resolution transient IR absorption measurements to study the spatial dependence of the relaxation dynamics. Our results show that the net angular momentum of the initially centrifuged molecules persists for at least 10 gas kinetic collisions and that the translational energy distributions are dependent on the probe orientation and polarization. These studies indicate that the centrifuged molecules tend to maintain the orientation of their initial angular momentum for the first set of collisions and that relatively large changes in J are involved in the first collisions.