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Applications of Zeeman quantum beat spectroscopy to angular momentum polarization studies

New applications of Zeeman quantum beat spectroscopy (ZQBS) are employed to study the angular momentum polarization effects in photodissociation and molecular collision. The magnitude and the dynamical behaviour of angular momentum alignment and orientation, two types of polarization, can be measured via ZQBS technique on a shot-by-shot basis. The present study shows how the ZQBS technique improves the ability of the conventional LIF technique for observing angular momentum polarization, and also opens the possibility of controlling the angular momentum using a magnetic field for various applications.

The first half of this presentation provides a brief account of our recent works on measuring the collisional depolarization of the electronically excited state radicals, i.e. OH(A) and NO(A), in the presence of the rare gas collider partners. The depolarization caused by elastic or inelastic collisions is associated with the role of the molecular interactions in the collision dynamics. The second half describes the study of photodissociation, and focuses attention on the angular momentum polarization orientation in the OH(X) photofragments from photodissociation of H₂O₂. The discussion about the possible mechanisms due to coupling of a circularly polarized photon to electronic or nuclear motion of a parent molecule is also provided.

Reference:

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2. M. Brouard, H. Chadwick, Y.-P. Chang, R. Cireasa, C. J. Eyles, A. O. La Via, N. Screen, F. J. Aoiz and J. Klos, *J. Chem. Phys.* **131**, 104307, (2009).
3. M. Brouard, H. Chadwick, Y.-P. Chang, R. Cireasa and C. J. Eyles, *Physica Scripta* **80**, 048120, (2009).
4. M. L. Costen, R. Livingstone, K. G. McKendrick, G. Paterson, M. Brouard, H. Chadwick, Y.-P. Chang, C. J. Eyles, F. J. Aoiz and J. Klos, *J. Phys. Chem. A* **113**, 15156, (2009).