Fully quantum state resolved dipolar molecular collisions

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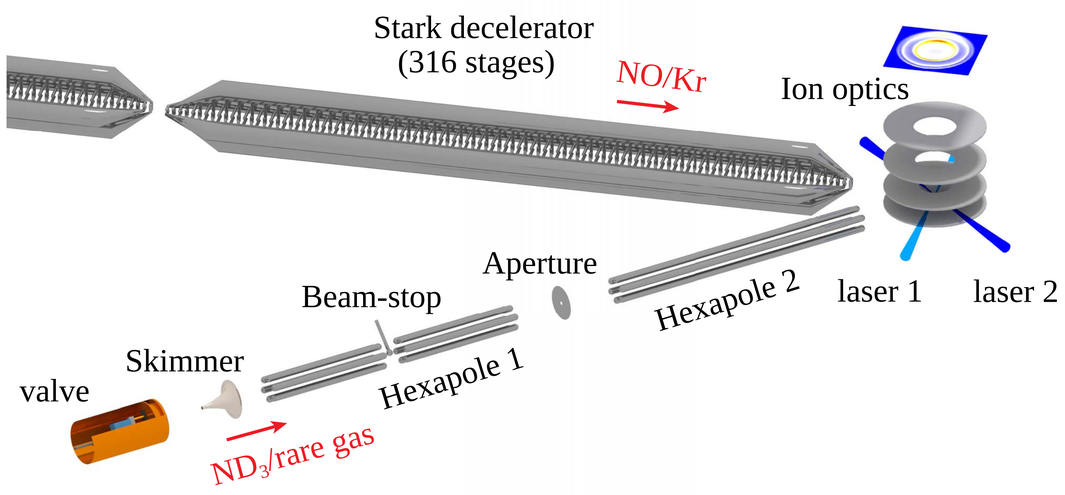
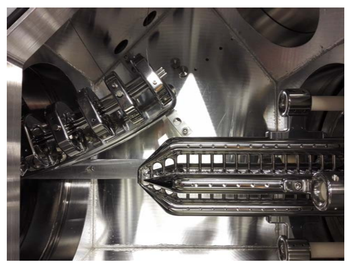
Introduction

The crossed molecular beam technique proved to be a sophisticated approach to obtain detailed information of potential energy surface. Despite the success studying collisions between bimolecules[1], fully quantum-state resolved bimolecular collisions are experimentally more challenging because of the low particle density in the colliding beams.

We used a Stark decelerator and a hexapole to produce two molecular beams of NO and ND_3 with both almost perfect quantum-state purities. State-resolved inelastic collisions between NO($X^2\Pi_{1/2}$, j=1/2, *f*) and ND_3(J_kp=1_1-) molecular beams have been studied in a broad energy range.

Crossed and merged beam setups

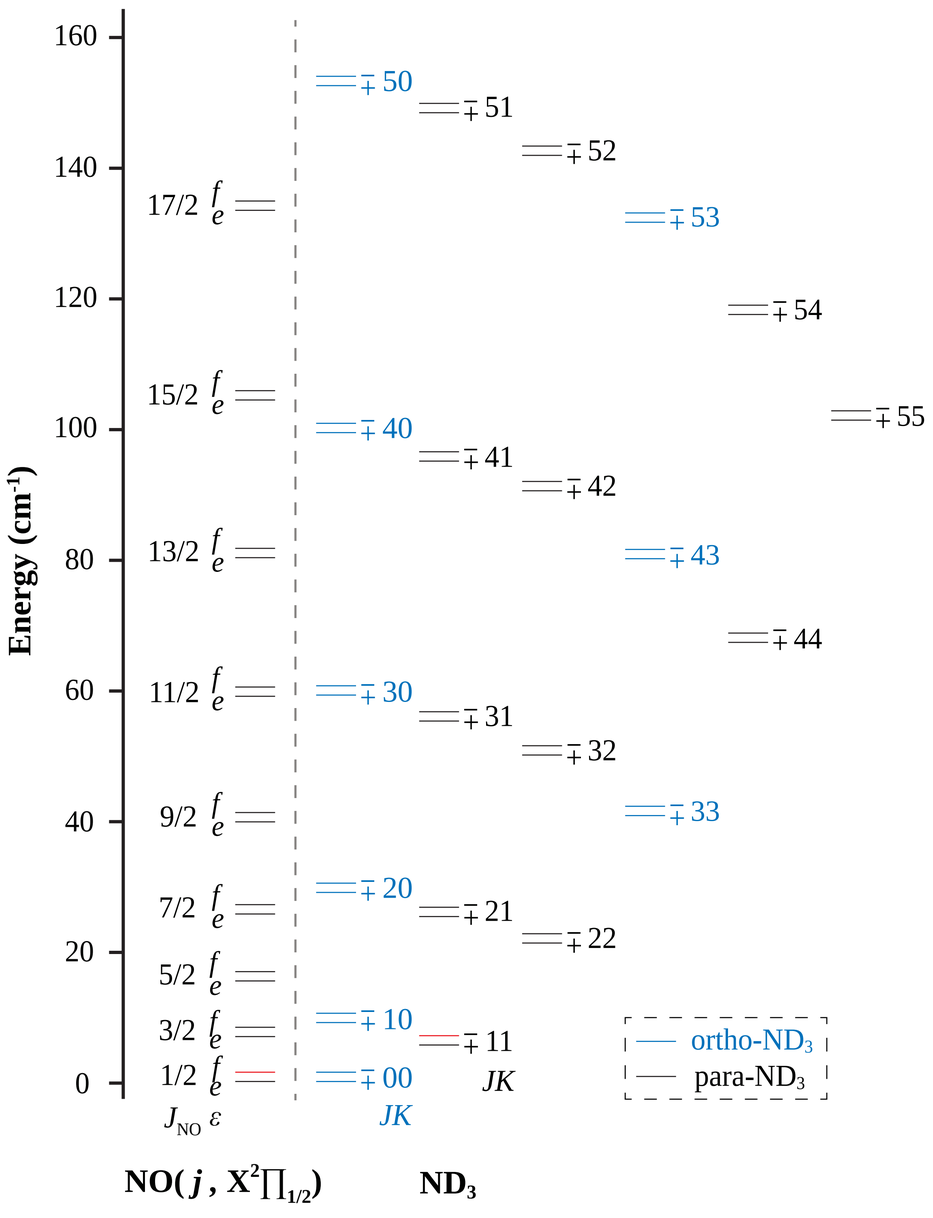


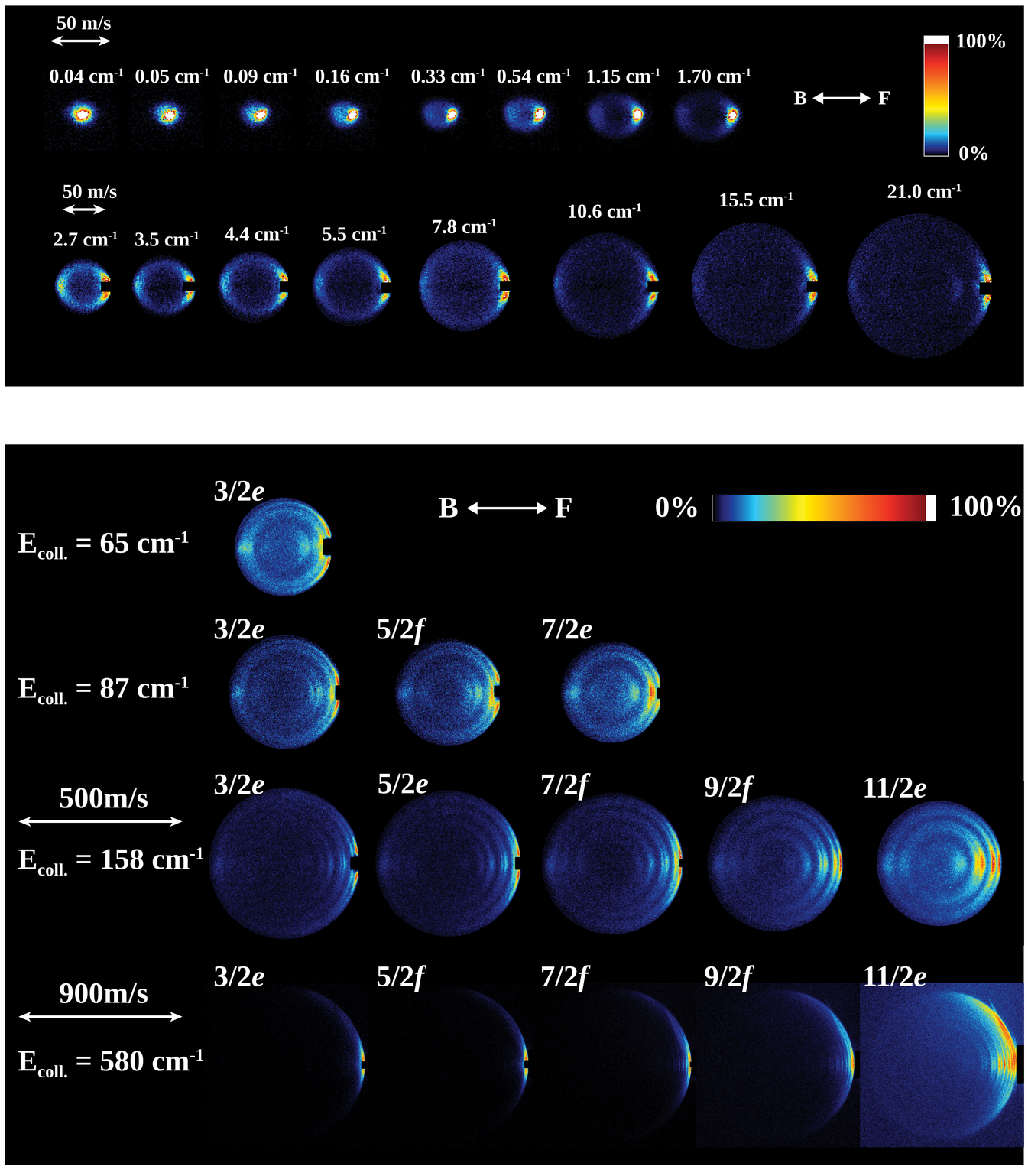


NO(1/2*f*) + ND_3(1_1-) collisions

Hexapole

- State-selected ND_3 molecules (1_1-)
- Focused molecular beam
- Eliminating the effects of the carrier gas





Reference

[1] Zhi Gao, Tijs Karman et al, Nature Chemistry 10, 469 (2018)

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