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Quantum state dependent chemistry of ultra-cold ${}^6\text{Li}_2$ dimers

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Reactive and inelastic collisions of ultra-cold molecules has generally been observed to follow a universal rate law described by the quantum Langevin model. The salient feature of this law is an independence of the reaction probability from the short-range physics of the interaction. We report on reactive and inelastic collisions of ${}^6\text{Li}_2$ dimers in several ro-vibrational states of the $a(13\Sigma^+u)$ potential. While the $v = 0, 5, 8$ are observed to decay at the universal limit, decay of the $|v = 9, N = 0\rangle$ state exhibits a deviation from universality, opening up the possibility of using external magnetic fields to tune the reaction rate.

Author: FRIELING, Erik (University of British Columbia)

Co-authors: UHLAND, Denis (UBC); POLOVY, Gene; Prof. MADISON, Kirk (UBC)

Presenter: FRIELING, Erik (University of British Columbia)

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