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Quantum-state controlled radical-ion reactions HEATHER LEWANDOWSKI, PHILIPP SCHMID, JAMES GREENBERG, MIKHAIL (KYLE) MILLER, University of Colorado / JILA — Radicals and ions frequently play an important role in gaseous media such as the Interstellar Medium (ISM), the upper atmosphere, flames, plasmas, etc. Although collisions in the ISM between ions and radicals are very rare events, the long timescales involved mean such reactions make important contributions to the pathways for assembly and destruction of complex chemical species. Unfortunately, experimental measurements of the rates and particularly the dynamics of reactions *between* ions and radicals are very few and far between. Our system overcomes some of the experimental challenges by using trapped molecular ions and Stark decelerated neutral radicals. Here, we can study reactions between molecules in single quantum states down to millikelvin temperatures. Our very high sensitivity allows us to study reactions where the reaction rate can be as low as one reaction per minute.

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