

GEC18-2018-000443

Abstract for an Invited Paper
for the GEC18 Meeting of
the American Physical Society

Tuning charge transfer between heavy partners at low scattering energies¹

ROBIN COTE, Univ of Connecticut - Storrs

We explore the effect of long-range interactions on neutral-ion collisions and how they can be used to control the outcome of scattering events at low energy. In particular, we explore how the state of the projectile can influence the type of long-range interaction, leading to barriers that reduce or even prevent reactions in some cases, or accentuate the attractive polarization interaction that increase reaction rates in other cases. We discuss results obtained in new types of hybrid traps, where ultracold neutral atoms are overlapping with a crystal of atomic or molecular ions, and in which individual reactions can be detected. We present results on two polyatomic molecular ions reacting with excited Ca atoms, namely BaOCH_3^+ and BaCl^+ . For reactions to take place, Ca needs to be in an excited state, and the reaction rate depends strongly on the spin state of the excited state of Ca, i.e. either 1P or 3P . We also discuss a different approach to affect charge exchange in atom-ion collision, namely using Feshbach resonance. This is a different example of using spin-states to affect reactions. Finally, we will present a simple formulation for the charge exchange in the case of resonant processes, linking the s-wave regime to higher temperatures.

¹Partially supported by the MURI US Army Research Office Grant No. W911NF-14-1-0378.