Trapped ultracold neutrons – a tool for studies in fundamental physics

OLIVER ZIMMER

Institut Laue Langevin, France

In our laboratory we have used a cryogenically cooled electrostatic ion beam trap to carry out studies of the reaction dynamics of energy-selected neutral reactive intermediates produced by photodetachment of negative ions. Taking advantage of the field-free region in the center of the Zajfman-style beam trap, we have measured photoelectron energy and angular distributions and carried out, in coincidence on an event-by-event basis, measurements of the neutral photofragment recoil to completely kinematically characterize dissociative photodetachment processes. Using these experimental techniques we have obtained significant new spectroscopic information on the combustion intermediate HOCO, and characterized experimentally for the first time the barrier to tunneling to H + CO_2 products. These results will be reviewed as an illustration of the applications of electrostatic ion beam traps to the study of molecular reaction dynamics. This work was supported by the U.S. Department of Energy under grant DE-FG03-98ER14879.