THE PHOTOELECTRON ANGULAR DISTRIBUTION AS A PROBE OF ENERGETICALLY INDISTINGUISABLE CHANNELS IN PHOTODETACHMENT

MATTHEW VAN DUZOR, FOSTER MBAIWA, JIE WIE and RICHARD MABBS, *Department of Chemistry, Washington University, One Brookings Dr., Campus Box 1134 Saint Louis, Missouri 63130, USA.*

Photoelectron imaging measurements of $I^-\cdot CH_3CN$ are presented from the lowest energy $I(^2P_{3/2})\cdot CH_3CN$ channel threshold to 0.3 eV above the $I(^2P_{1/2})\cdot CH_3CN$ threshold. Excitation of the cluster just below the latter threshold leads to competition between direct detachment and the production of a dipole-bound state $[I(^2P_{1/2})\cdot CH_3CN]^-$. Subsequent relaxation of the I moiety ($^2P_{1/2} \rightarrow {}^2P_{3/2}$) occurs via autodetachment of the dipole bound electron. However, the autodetached electrons are energetically equivalent to those directly detached via the $^2P_{3/2}$ channel. While the photoelectron spectrum is insensitive to this phenomenon, the kinetic energy dependence of the photoelectron angular distribution (PAD) of the $^2P_{3/2}$ channel reflects these dynamics. Dramatic changes are observed within a 100 meV window of the $I(^2P_{1/2})\cdot CH_3CN$ threshold. Although previously unreported, further results are presented that show sharp changes in the PAD are relatively common in $I^-\cdot X$ cluster anions (X=polar molecule).