INFRARED RESONANCE ENHANCED PHOTODISSOCIATION SPECTROSCOPY OF $Ni^+(CO_2)_n$, $Ni^+(CO_2)_nAr$, AND $Ni^+(O_2)(CO_2)_n$ CLUSTERS

N.R. WALKER, G.A. GRIEVES, R.S. WALTERS and M. A. DUNCAN, *University of Georgia, Department of Chemistry, Athens, GA, 30602-2556*.

$Ni^+(CO_2)_n$ and $Ni^+(CO_2)_nAr$ ion-molecule complexes are produced by laser vaporization in a pulsed nozzle source and studied with mass-selected infrared resonance-enhanced photodissociation spectroscopy (IR-REPD). Photofragment yield is measured as a function of energy in the region of the asymmetric stretch vibration of CO_2 (2349 cm^{-1}). Fragmentation of $Ni^+(CO_2)_n$ complexes proceeds by the loss of intact CO_2 units. The mixed clusters fragment by loss of Ar, permitting higher photofragment yields and sharper spectra than those provided by the corresponding pure $Ni^+(CO_2)_n$ complexes. Spectra for the $n \leq 4$ complexes depict asymmetric stretches to the blue of free CO_2 while solvation effects are observed in the larger complexes. An additional blue-shifted band is observed in complexes with $n \geq 6$, indicating that the Ni^+ ion participates in a cluster-assisted chemical reaction producing a nickel oxide. This inference is supported by the results of experiments on $Ni^+(O_2)(CO_2)_n$ complexes, where a blue-shifted band is also observed.