

PHOTOELECTRON SPECTROSCOPY STUDIES OF URANIUM FLUORIDE

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The uranium fluoride anions (UF_x^- , $x=2 - 4$) are produced by laser vaporization and investigated using photoelectron spectroscopy at four different photon energies. An extensive vibrational progression of 620 cm^{-1} is observed in the spectra of UF_4^- , indicating significant geometry change between the anion and the neutral ground states. Franck-Condon simulation is performed to identify the vertical detachment and the 0-0 transition to get the electron affinity of the neutral UF_4 . Preliminary ab initio calculation shows that the U 5f orbitals participate in the bonding with F 2p orbitals. The UF_3^- molecule has multiple vibrational modes active upon electron detachment, yielding congested photoelectron spectra. Two vibrational progressions are observed in the UF_2^- spectra at 580 cm^{-1} and 160 cm^{-1} .