MOMENTUM DICTATES INTENSITY: UNUSUAL OBSERVATIONS IN PHOTOELECTRON SPECTROSCOPY

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Striking variations in excited state band intensities were observed in the photoelectron spectra of $\mathrm{Sm_2O^-}$ collected using eight different photon energies. The spectra exhibit a pronounced overall increase in excited state band intensities relative to the transition to the ground neutral state as the photon energy decreases. This anomaly opposes that which would be expected to arise from threshold effects. The photoelectron spectra of several homonuclear Sm and heteronuclear Sm-Ce oxides collected previously with the second and third harmonic outputs of a Nd:YAG (2.33 eV and 3.49 eV) reveal a similar relationship, making the likelihood of coincidental resonance seem remote. Moreover, the absence of this phenomenon in homonuclear Ce-based clusters implicates the exceptionally high density of accessible spin states originating from the partially-filled 4f subshell of Sm. In addition, a broad oscillation in plots of the relative band intensities versus electron kinetic energy may map onto quasibound states of the anion. The results presented bear significance in the study of other electron-rich systems and models the interaction of the photoelectron and remnant neutral-like species.