CROSS-SECTION RATIOS OF MULTIPLE-PHOTOIONIZED C_{60} CLUSTERS

P.N. Juranic[1], R. Wehlitz[1] , D. Lukic[2], K. Barger[3]
[1] Synchrotron Radiation Center, UW-Madison, Stoughton, WI 53589
[2]Columbia Astrophysics Laboratory, ColumbiaUniversity, New York 10027
[3]Western Washington University, Bellingham, WA 98225

The C_{60}^{2+}/ C_{60}^{+}, C_{60}^{3+}/ C_{60}^{+} and C_{60}^{4+}/ C_{60}^{+} photoionization cross-section ratios have been obtained by using synchrotron radiation with photon energies between 19 and 280 eV. The measurements were carried out on the U1-NIM, 6m TGM, the Wadsworth, and Mark II Grasshopper beamlines using an oven to vaporize C_{60} powder and synchrotron light to photoionize the gas. The gas was then analyzed via time-of-flight (TOF) spectroscopy using pulsed electric fields sending the ions into a drift tube with a MCP Z-stack at the end. The measurements are a great improvement to existing data[1,2] in both quantity and quality, comprehensively mapping out the relative cross-section's photoionization energy dependence from the double-ionization threshold to just below the inner K shell of the C_{60} molecule. The photoionization energies of the doubly, triply, and quadruply charged C_{60} has been measured very accurately as a result. The more accurate and numerous data we have acquired has shown that the C_{60}^{2+}/ C_{60}^{+} cross-section ratio curve also reveals an unexpected oscillatory behavior. There seems to be two sets of oscillations that exist in the relative cross-section: one starting at lower energies (19 eV), and one starting at higher (38 eV). In addition to procuring the above-mentioned curves, we have also observed the photoionization-induced fragmentation of C_{60}, measuring multiple-ionized fragments as small as C_{48}. The appearance energies for these curves have been studied and compiled, giving completely new data on many of the smaller fragments and their characteristic relative cross-section curves.

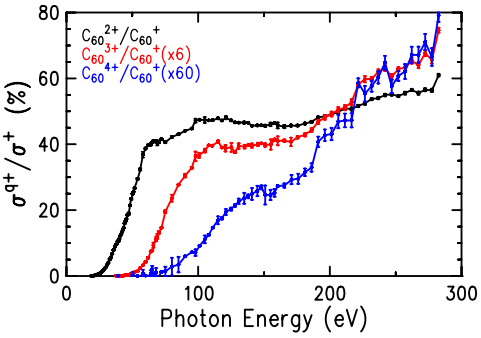

Figure 1: Photoionization cross-section ratios for C_{60} with **q**=2 (black), 3 (red), 4 (blue), the latter two scaled appropriately.

*The SRC is supported by NSF grant No. DMR-0084402.

[1]Drewello et al**.,** Int. Journal of Mass Spectrometry and Ion Processes **124**, R1-R6 (1993).
[2]Reinkoster et al., Journal of Physics B: At. Mol. Opt. Phys. **3**, 2135-2144 (2004).