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electrical currents when the applied electrical potential is varied to permit or suppress the escape of the secondary electrons. Initial measurements were made with a Faraday cup which has an isolated entrance aperture (suppressor) which was energized to alter the electrical field in front of the 304 stainless steel surface where the ions impact at normal incidence. The measured current as a function of the applied suppressor voltage demonstrate the complete suppression and the sufficient extraction of the secondary electrons. Secondary electron yields measured for Ar^{5+} through Ar^{18+}, which were extracted from the KSU-CRYEBIS at 3kV/q, agree roughly with model predictions, but show important features which are not predicted by any model of secondary electron emission.

* Supported by the Division of Chemical Sciences, Office of Basic Energy Sciences, Office of Energy Research, U.S. Department of Energy.

K3 6 Observation of Post-Collision Interaction in Photoion-Auger Electron Coincidence Measurements. J. C. LEVIN, N. KELLER, R. D. MILLER, I. A. SELLIN, UT/ORNL, D. W. LINDLE, UNLV, Y. AZUMA, N. BERRAH MANSOUR, WMU/ANL.— We have detected argon photoions in coincidence with Ar K-$L_{23}L_{23}$ Auger electrons as a function of photon energy. The resulting simplified charge distribution consists almost entirely of Ar^{3+}, Ar^{4+}, and Ar^{5+}. The triply charged ion is present in substantial quantities well-above the K-shell ionization threshold, even though the coincidence requirement results in two L-MM decays which leaves four M vacancies, suggesting a residual Ar^{4+} ion. This can be explained by the recapture of the K photoelectron into bound rydberg levels via post-collision interaction. In this process, the photoelectron transfers energy to the K-$L_{23}L_{23}$ Auger electron and is itself left with insufficient energy to escape the residual ionic core. The experiment was performed using time-of-flight techniques on NIST beamline X-24A at NSLS. Silicon monocromator crystals were employed, resulting in higher resolution than obtained in our previous measurements.[1]

[1] J. C. Levin, C. Biedermann, N. Keller, L. Liljeby, C.-S. O, R. T. Short, and I. A. Sellin, Phys. Rev. Lett. 65, 988 (1990).

K3 7 K-shell Ionization and Compound Nucleus X-Ray Production Across a Clear Resonance in the p + Ba-134 Reaction,* D.W. SPOONER, W.E. MEYERHOF, J.N. SCHEURER, N.A. GUARDALA, A. BELKACEM and H.P. HÜLSKÖTTER, Stanford University. The probability of compound nucleus (CN) and separated atom (SA) x-ray emission in elastic p + Ba-134 collisions has been measured as a function of proton energy near the isobaric analog nuclear resonance at 9.295 MeV at a mean angle of 172 deg. Our results at five proton energies show excellent agreement with the predicted K-shell ionization probability in the vicinity of the resonance. The energy spectra of the ionizing protons, which reflect the delta-electron energy distribution, are compared to theoretical distributions. Integrating over the region of the resonance, the measured ratio of CN to SA K x-rays is less than 5%, from which we deduce an upper limit for the peak CN cross section of 4 mb/sr at a proton scattering angle of 172 deg.

*Supported in part by NSF grants PHY-8614650 and PHY 9019293 (Stanford University).

K3 8 **Formation of Energetic Positronium Atom Beams,*** S. Tang and C. M. Surko, University of California San Diego. Positronium (Ps) beams with narrow energy spread and small angular divergence are useful as probes of surfaces, atoms, and molecules,[1] and we have previously described how such a Ps beam can be used as a diagnostic of transport in fusion plasmas.[2] We have constructed a Ps beam, in the energy range 50–200 eV, by directing a positron beam through a H_2 gas cell, in which the positronium atoms are formed by charge exchange. We find that the cross-section for Ps production in the forward direction is in agreement with recent theoretical predictions[3] at 100 eV. The angular distribution of the positronium atoms formed at various energies is currently being measured. The results will be reported and compared with the recent theoretical calculations.[3]

* This work is supported by the U. S. Department of Energy.

[1] M. H. Weber et al., Phys. Rev. Lett. **61**, 2542, (1988); M. Charlton and G. Laricchia, J. Phys. **B**: At. Mol. Opt. Phys. **23**, 1045, (1990).

[2] T. J. Murphy, Plasma Phys. Contr. Fusion **29**, 549 (1987); C. M. Surko et al., Rev. Sci. Instrum. **57**, 1862, (1986).

[3] A. S. Ghosh, private communication.

K3 9 A Positron Accumulator B. GHAFFARI, R.S. CONTI, T.D. STEIGER Dept. of Phys., Univ. of Mich.— Results from a positron accumulator which works efficiently at repetition rates of 100 – 250 Hz are presented. Moderated β's from a radioactive source are accumulated in a Penning-style trap with a slowly-varying electric potential applied to the moderator. The accumulation efficiency is a function of the confining electric fields and the pressure in the trap. This dependence indicates that the primary trapping mechanisms are scattering from positive ions and possibly electrons. The maximum accumulation efficiency is 20% which yields positron pulses of 120 ns FWHM. Several techniques for further reducing this time spread are discussed. These techniques reduce the pulse width to 25 ns without significantly increasing the energy spread of the positrons.

K3 10 **Negative Ions of the Lanthanides.** M.A. GARWAN, X-L. ZHAO, M-J. NADEAU, A.E. LITHERLAND, AND L.R. KILIUS, *IsoTrace Laboratory, University of Toronto, Toronto, Canada*—The negative ions of the lanthanides (*La* to *Lu*) have been observed (with the exception of *Pm, Dy, Ho,* and *Er*) using accelerator mass spectrometry (AMS). The heavy element analysis line at the IsoTrace Laboratory was used to count the positive ions resulting from the atomic negative ions injected into the Tandem accelerator. The negative ion yields for the lanthanides were higher for the lower Z elements in the group than for the ones of higher Z. Yb^- is difficult to observe, because of its suspected very low electron affinity, and its detection required the reduction of the electric field gradients used to accelerate the ions. *Dy, Ho,* and *Er* are still to be investigated further at lower electric field gradients. Both Yb^- and Lu^- have recently been theoretically predicted to exist with negative parity ground states.[1]

[1] S.H. Vosko, J.A. Chevary, and I.L. Mayer, J. Phys. B, 24, 225 (1991), and private communication and this bulletin.

K3 11 Space Shuttle Based Observations of Atmospheric Nitric Oxide Emissions P.S. Armstrong, W.A.M. Blumberg, S.J. Lipson, J.R. Lowell, R.M. Nadile, R.H. Picard, J.R. Winick, Phillips Laboratory/Geophysics Directorate, Optical Environment Division, J.A. Dodd, Stewart Radiance Laboratory--Intense 5.3-micron nitric oxide rovibrational fundamental band emissions were observed using the CIRRIS 1A interferometer flown aboard the STS-39 Shuttle mission. This unique, high-resolution, cryogenic spectrometer was used to obtain atmospheric limb data in several infrared filter bandpasses and over a range of tangent heights. Observations were made during a variety of environmental conditions, including day and night ambient, and aurorally disturbed. Preliminary analysis has concentrated on vibrational and rotational distributions, and altitude dependence, with special attention to rotationally hot emissions, including R-branch bandheads. These results provide valuable tests of current atmospheric models.

This work was supported by the Air Force Office of Scientific Research and the Defense Nuclear Agency.

K3 12 **The Macdonald Laboratory at Kansas State University as a User Facility for Atomic Physics Studies.*** PAT RICHARD, J.R. Macdonald Lab, Kansas State Univ., Manhattan, KS 66506--The JRM Laboratory currently operates two full time facilities for