BULLETIN

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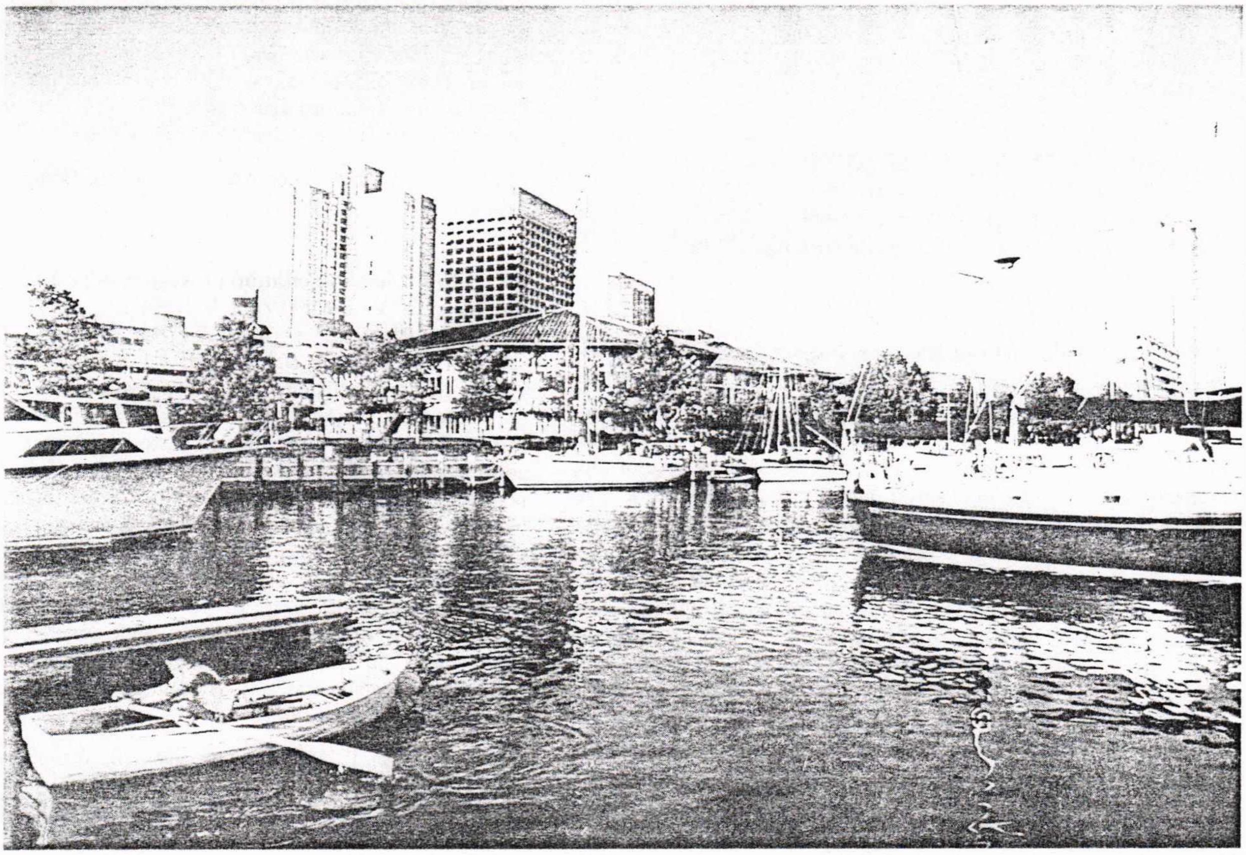

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IWP2 11 Thermal Gas Phase Electron Attachment Reactions of Sulfuryl- and Thionyl-halides at 300 K JANE M. VAN DOREN, *College of the Holy Cross* MATTHEW S. THOMPSON, *College of the Holy Cross* ELIZABETH M. MONACO, *College of the Holy Cross* MATTHEW F. WSZOLEK, *College of the Holy Cross* The reactions of the sulfuryl-halides SO_2Cl_2, SO_2ClF, and SO_2F_2, and thionyl-halides $SOCl_2$ and SOF_2 were studied in the gas phase under thermal conditions at 300K with a Flowing Afterglow Langmuir Probe with mass spectrometric detection. The chloride-containing species react efficiently with electrons while the fluoride analogues react relatively inefficiently. All of these species react with electrons through cleavage of the sulfur-halide bond. Non-dissociative attachment is also observed in the reaction with sulfuryl fluoride. In the reactions of both thionyl halides as well as that of sulfuryl chloride, the only observed product ion is the atomic halogen anion. In the reaction of sulfuryl fluoride, cleavage of the sulfur-fluorine bond leads to the formation of SO_2F^- + F. Both possible primary product anions are observed for the mixed sulfuryl halide (SO_2ClF), Cl^- and SO_2F^-. Efficient secondary ion-molecule reactions were also identified and their products were characterized.

SESSION IWP3: POSTER SESSION: ELECTRON-ATOM COLLISIONS
Wednesday afternoon, 6 October 1999
Poplar Room Sheraton Waterside Hotel at 13:30

IWP3 12 Measurement of Electron-Impact Cross Sections using Trapped Rb atoms* M. L. KEELER, TODD A. ZIMMERMAN, JOHN B. BOFFARD, THAD WALKER, L. W. , CHUN C. LIN, *University of Wisconsin-Madison* A magneto-optical trap (MOT) can act as a compact, high number density, source of low velocity atoms for use in electron-impact cross section work. The low initial velocity of the trapped atoms, allows the measurement of electron total scattering cross sections by determining the loss rate of recoiled atoms from the trap. Electron-impact ionization cross sections can also be measured in an analogous manner, since the resulting ions are also lost from the trap. When the trapping lasers are 'on', a substantial fraction of atoms in the trap are in the excited $5^2P_{3/2}$ level. This allows the trap to serve as a source for measurement of excitation and ionization measurements from the laser excited $5^2P_{3/2}$ level. Sample results from these various measurements will be presented.

*This work supported by the National Science Foundation and the Air Force Office of Scientific Research.

IWP3 13 Electron Excitation out of the Metastable Levels of Neon* JOHN B. BOFFARD, M. L. KEELER, L. W. ANDERSON, CHUN C. LIN, *University of Wisconsin-Madison* The $2p^53s$ configuration of neon has two metastable levels the $^3P_0$ ($1s_3$ in Paschen's notation) and $^3P_2$ ($1s_5$) levels. Due to low energy threshold for excitation of these long-lived levels, the low number density of metastable atoms can have a substantial effect on many plasma properties. We have measured cross sections for electron-impact excitation into the ten levels of the $2p^53p$ configuration. For the J = 1,2,3 levels, the cross sections for excitation from the metastable levels are two to three orders of magnitude larger than the corresponding excitation cross sections from the ground state. For the two J = 0 levels, however, the metastable excitation cross sections are less than an order of magnitude larger.

*This work supported by the National Science Foundation and the Air Force Office of Scientific Research.

IWP3 14 Electron-impact excitation of Kr atoms* J. ETHAN CHILTON, CHUN C. LIN, *University of Wisconsin-Madison* Previous work in our lab has involved the study of electron impact excitation of the $2p$ (Paschen's notation) levels of Ne, Ar, and Xe, using the optical method. The Xe atom differs from Ar and Ne in that it is close to the itj-l coupling scheme in which the $5p^5\ ^2P_j$ core angular momentum j (1/2 or 3/2) first couples with the orbital angular momentum l and then with the spin of the outer electron. For Xe, the ten $2p$ levels ($5p^56p$) separate into an upper group of four levels and a lower group of six, corresponding to the j = 1/2 and j = 3/2 cores, respectively. The lower group has much larger cross sections than the upper group. Such two-group patterns are not found in the $2p$ cross sections for Ar and Ne. We now report preliminary measurements of Kr, whose excited level structure more closely resembles Xe. Most of the $2p \rightarrow 1s$ transitions lie in the visible region (0.5 to 0.9 μm), easily accessible with a monochromator/PMT apparatus. The remaining $2p \rightarrow 1s$ transitions as well as the cascade into the $2p$ manifold, however, lie in the infrared region (0.9 - 2.6 μm), and are measured with our Fourier-transform spectrometer.

*Supported by the United States Air Force Office of Scientific Research.

IWP3 15 Electron Excitation of Argon: 4s'[1/2]$_1$, 4p[1/2]$_1$, and 4p'[1/2]$_0$ D. V. FILIPOVIĆ, V. PEJČEV, B. MARINKOVIĆ, *Institute of Physics, P. O. Box 57, 11001 Belgrade, YU* L. VUŠKOVIĆ, *Old Dominion U., Norfolk, VA* A broad interest in low-energy electron collisions with argon has recently led to very sophisticated calculations.[1,2,3] The agreement between theoretical results and the only existing full set of experimentally obtained absolute differential cross sections[4] is not satisfactory. We have performed a set of experiments to resolve existing discrepancies between available data. At the conference we will present absolute differential cross sections for argon excited in 4s'[1/2]$_1$, 4p[1/2]$_1$, and 4p'[1/2]$_0$ states by electron collision. The incident electron energies were in the range of 16 to 80 eV and overall energy resolution was 40 meV. The angular range covered in our experiments was 5° to 150°. Data were extrapolated to 0° and to 180° and numerically integrated to yield integral, momentum transfer, and viscosity cross sections.

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[3]V. Zeman, K. Bartschat, C, Noren, and J. W. McConkey, Phys. Rev. A **58**, 1275 (1998).
[4]A. Chutjian and D. C. Cartwright, Phys. Rev. A **23**, 2178 (1981).

IWP3 16 Electron Impact Excitation of Krypton X. GUO, *Dept of Physics, California State University, Fullerton, CA* G. MIKAELIAN, *Dept of Physics, California State University, Fullerton, CA* D.F. MATHEWS, *Dept of Physics, California State University, Fullerton, CA* M.A. KHAKOO, *Dept of Physics, California State University, Fullerton, CA* A. CROWE, *Dept of Physics, University of Newcastle, Newcastle, UK* V. ZEMAN, *Maths Department, University of Nottingham, Nottingham, UK.* K. BARTSCHAT, *Dept Of Physics and Astronomy, Drake University, Des Moines, IA* C. J. FONTES, *Applied Theoretical and Experimental Computational Physics Division, Los Alamos National Laboratory, Los*