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WJ06

PHOTOIONIZATION SPECTROSCOPY OF ISOLATED Cr ATOMS IN ULTRACOLD HELIUM NANODROPLETS

15 min 3:27

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Recently we succeeded in doping Cr atoms to He nanodroplets (He_N) at 0.4 K^a and carried out resonance ionization mass spectroscopy (RIMS). Here we present resonant two-photon ionization (R2PI) measurements in the wavelength range from 350 to 361 nm ($27700 - 28600 \text{ cm}^{-1}$, 3.43 - 3.54 eV). As one of several possible ionization pathways we allocate a first excitation step to the $y^7P^o \leftarrow a^7S_3$ transition, happening inside the He_N . Due to the interaction with the surrounding He this excitation appears broadened in the spectra and gives the possibility to obtain detailed information about the perturbation upon electronic excitation of the Cr atom in He_N^b . Subsequently, the dopant atom leaves the He_N and is ionized in the gas phase where discrete free atom autoionization levels are populated leading to additional sharp spectral features. Future investigations with two photon two color ionization and selective electron energy ionization as well as quantum chemistry calculations will be discussed.

^aM. Ratschek, M. Koch, and W. E. Ernst, *J. Chem. Phys.*, in press (2012)

^bC. Callegari and W. E. Ernst, *Helium Droplets as Nano cryostats for Molecular Spectroscopy - from the Vacuum Ultraviolet to the Microwave Regime*, in *Handbook of High-Resolution Spectroscopy*, eds. M. Quack and F. Merkt, John Wiley & Sons, Chichester, 2011.

WJ07

PHOTOIONIZATION OF HIGHLY CHARGED ARGON IONS AND THEIR DIAGNOSTIC LINES

15 min 3:44

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Lines of highly charged He-like and Li-like ions in the ultraviolet and X-ray regions provide useful diagnostics for the physical and chemical conditions of the astrophysical as well as fusion plasmas. For example, Ar XVII lines in a Syfert galaxy have been measured by the X-ray space observatory Chandra. Results on photoionization of Ar XVI and Ar XVII obtained from relativistic Breit-Pauli R-matrix method and close-coupling approximation will be presented. Important features for level-specific photoionization for the diagnostic w, x, y, z lines of He-like Ar XVII in the ultraviolet region will be illustrated. Although monotonous decay dominates the low energy photoionization for these ions, strong resonances appear in the high energy region indicating higher recombination, inverse process of photoionization, at high temperature. The spectra of the well known 22 diagnostics dielectronic satellite lines of Li-like Ar XVI will be shown produced from the the KLL resonances in photoionization.

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