PHOTOIONIZATION SPECTROSCOPY OF ISOLATED Cr ATOMS IN ULTRACOLD HELIUM NANODROPLETS

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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 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.

[a] M. Ratschek, M. Koch, and W. E. Ernst, J. Chem. Phys., in press (2012)

[b] C. Callegari and W. E. Ernst, Helium Droplets as Nanocryostats 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.