Spectroscopy of doped superfluid helium nanodroplets (HeN) gives information about the influence of this cold, chemically inert, and least interacting matrix environment on the excitation and relaxation dynamics of dopant atoms and molecules. We present the results from laser induced fluorescence (LIF), photoionization (PI), and mass spectroscopy of Cr and Cu doped HeN. From these results, we can draw a comprehensive picture of the complex behavior of such transition metal atoms in HeN upon photo-excitation. The strong Cr and Cu ground state transitions show an excitation blueshift and broadening with respect to the bare atom transitions which can be taken as indication for the solvation inside the droplet. From the originally excited states the atoms relax to energetically lower states and are ejected from the HeN. The relaxation processes include bare atom spin-forbidden transitions, which clearly bears the signature of the HeN influence. Two-color resonant two-photon ionization (2CR2PI) also shows the formation of bare atoms and small Cr-He_n and Cu-He_n clusters in their ground and metastable states. Currently, Cr dimer excitation studies are in progress and a brief outlook on the available results will be given.

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\[a\] 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.


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