MAGNETIC DICHROISM OF POTASSIUM ATOMS ON THE SURFACE OF HELIUM NANODROPLETS

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We measured laser induced fluorescence spectra of potassium atoms on the surface of superfluid helium droplets, with and without a moderately strong external magnetic field (≈ 3 kG). With no magnetic field we demonstrate saturation of the D lines with a few hundred mW of laser power. With magnetic field, under saturation, we observe a greater signal for linear polarization but no difference between the two states of (circular) polarization of the exciting laser. We take this as evidence that the two spin sublevels of the ground-state K atom are equipopulated, despite a Zeeman splitting comparable in magnitude to kT (at the temperature of the droplet, $T = 0.38$ K). We estimate that the rate of spin relaxation induced by the droplet, if any, must be < 1000/s. Our measurements already show that, by selective depletion, it is possible to create a beam of He droplets doped with spin-polarized alkali atoms. We are in the process of further improving the accuracy of the experiment, and of testing our conclusions with one-color two-laser experiments. Further measurements on the potassium triplet dimer do show magnetic circular dichroism, suggesting that for this molecule the droplet does induce a fast spin relaxation.