Rotational dynamics of molecules in He droplets induced and probed by laser pulses

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Laser induced alignment, the method to confine the principal axes of molecules along axes fixed in the laboratory frame, is now used in a range of applications in physics and chemistry. With a few exceptions all studies have focused on isolated molecules in the gas phase.

Extension of alignment to molecules in He droplets is of interest for at least two reasons. First, alignment of molecules inside He droplets should enable studies or exploitation of the orientational dependence of molecular interactions as well as for extraction of molecular frame information in the presence of a dissipative environment. Second, the ability to control the degree of alignment implies being able to control the rotational angular momentum and coherence of the molecules inside the droplet. Some or all of the angular momentum and coherence may be transferred to the surrounding He atoms and as such open possibilities for laser-controlled excitation of collective angular momentum states, possibly quantized vortices [1].

The talk will present our experimental findings of laser-induced alignment of molecules in He droplets conducted both with femtosecond [2-3] and nanosecond pulses [4].

[1] L. F. Gomez *et al.*, *Science* **345**, 906 (2014).

[2] D. Pentlehner *et al.*, *Phys. Rev. Lett.* **110,** 093002 (2013).

[3] L. Christiansen *et al.*, *submitted*(2015).

[4] D. Pentlehner *et al.*, *Phys. Rev. A* **87,** 063401 (2013).