VORTEX LINE EXCITATIONS IN HELIUM NANODROPLETS

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Vortex lines, with quantized vorticity, are unique to superfluids and are ubiquitous in bulk superfluid helium. However, their presence has yet to be observed in the spectra of atoms or molecules solvated in superfluid helium nanodroplets. We will present the results of recent calculations we have made on the energy and angular momenta of these excitations, using the "hollow core model". It is found that vortex excitations require energies on the order of 100 cm^{-1}. While this energy scale is much higher than the 0.38 K droplet temperature, vortex line excitations are found to be the lowest energy states of the droplets with significant angular momentum. It is predicted that formation of the droplets and their pickup of solutes should deposit sufficient energy and angular momentum to allow the production of metastable vortex lines. Further, the vortex lines are predicted to be stable with respect to loss of angular momentum by helium atom evaporation or fission of the droplets.