

Superfluid Liquid Crystals and Supersolids

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The talk will provide an introduction to the concept of supersolids which must be distinguished carefully from spatially modulated superfluids. We show that the generic realization of a supersolid requires a finite density of defects in the ground state, as first suggested by Andreev and Lifshitz. As a concrete example we discuss dipolar gases and show that the transition to the supersolid phase is of first order, preempting the standard roton instability. A general hydrodynamic theory is presented for supersolids with a density modulation along a single direction. It displays two propagating modes associated with the two independent broken continuous symmetries. One of them describes the ballistic propagation of defects, thus generalizing the diffusive permeation mode of classical smectic-A liquid crystals.