

Dipolar gases: from supersolids to lattice models

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Due to dipole-dipole interaction dipolar quantum gases present qualitatively different physics compared with their non-dipolar counterparts. In these lectures, I will discuss some general ideas of the theory of dipolar gases, focusing initially on dipolar Bose-Einstein condensates, including issues like condensate stability and dipolar rotons. I will then move to the physics of dipolar droplets and supersolids, and discuss briefly on dipolar mixtures. In the second part of the lectures, I will move to dipoles in optical lattices, first focusing on dipolar Hubbard models, both on their ground-state properties and peculiar non-equilibrium dynamics. I will then move to dipolar spin models, illustrating the discussion with some particular examples.