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Hexatic, Wigner crystal and superfluid phases of dipolar bosons KAUSHIK MITRA, University of Maryland and NIST Gaithersburg, CARLOS SA DE MELO, Georgia Institute of Technology, CARL WILLIAMS, University of Maryland and NIST Gaithersburg — The finite temperature phase diagram of two-dimensional dipolar bosons versus dipolar interaction is discussed for different values of short range repulsions. We identify the stable phases as superfluid, dipolar Wigner crystal (DWC), dipolar hexatic liquid crystal (DHLC), and normal fluid. In particular, we show that the DWC exists at low temperatures for large dipolar interactions, but it melts into a DHLC at higher temperatures, where translational lattice order is destroyed, but orientational order is preserved. Upon further increase in temperature the DHLC phase melts into the normal fluid, where both orientational and translational lattice order are absent. We also find that the supersolid phase has always higher energy than the superfluid or Wigner crystal phases at low temperatures, but the supersolid is metastable, having an energy minimum that may be accessed through thermal quenching. Lastly, we calculate the static structure factor for each of the stable phases and show that each phase can be identified uniquely in an optical Bragg scattering experiment.

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