

# Long-range-interacting spin and Hubbard models with dipolar particles

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Very recent advances on dipoles in optical lattices and tweezer arrays are opening many intriguing novel possibilities, both for the simulation of Hubbard models and of spin models. I will first comment on extended Hubbard models, showing how strong inter-site interactions lead to a peculiar dynamics, characterized by Hilbert-space shattering and interaction-induced localization in absence of disorder. I will then discuss how the anisotropic nature of the dipolar interaction results in a surprising role of the transversal confinement on localization. Moreover, the transversal confinement also modifies very significantly the ground-state properties, resulting in enhanced liquefaction of self-bound lattice droplets, and in the appearance of intriguing novel insulating phases up to now unknown in the extended Hubbard model. Finally, I would like to comment as well on spin models, and in particular on the possibilities of very recent bilayer experiments with polar molecules, which open interesting questions concerning the effects of positional disorder and of thermalization dynamics.

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