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**Disorderless localization of polar gases in one-dimensional lattice**

ARYA DHAR, WEI-HAN LI, XIAOLONG DENG, University of Hanover, LUCA BARBIERO, University of Brussels, LUIS SANTOS, University of Hanover — One-dimensional polar gases in deep optical lattices present a severely constrained dynamics due to the interplay between dipolar interactions, energy conservation, and finite bandwidth. The appearance of dynamically-bound nearest-neighbor dimers results, due to the surprisingly relevant role of the  $1/r^3$  tail of the dipolar interactions, in localization via dimer clusterization for very low densities, even for moderate dipole strengths. Furthermore, even weak dipoles, allow for self-bound superfluid or metallic lattice droplets with a finite doping of mobile, but confined, holons. Our results, which can be extrapolated to other power-law interactions, are directly relevant for current and future lattice experiments with magnetic atoms and polar molecules.

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