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Repulsive shield between polar molecules ALEXEY GORSHKOV, MIKHAIL LUKIN, Harvard University, PETER ZOLLER, Institute for Quantum Optics and Quantum Information of the Austrian Academy of Sciences, HANS PETER BÜCHLER, University of Stuttgart — We propose and analyze a technique that allows to suppress inelastic collisions and simultaneously enhance elastic interactions between cold polar molecules. The main idea is to cancel the leading dipole-dipole interaction with a suitable combination of static electric and microwave fields in such a way that the remaining repulsive van-der-Waals-type potential forms a repulsive shield with controllable range. We analyze in detail the elastic and inelastic scattering cross sections, and outline a method towards efficient evaporative cooling of polar molecules. Furthermore, we show that this setup is suitable for the realization of three-dimensional crystalline structures.

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