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Controllable stability of dipolar gases in 1-D geometry[1] ROBIN CÔTÉ, JOHN MONTGOMERY, JASON BYRD, University of Connecticut Storrs
— We present results of the long-range interaction of dipolar molecules, considering in particular the case of KRb+KRb. The potential energy surface for this system has been obtained by *ab initio* calculations for various orientations of the dimers, and fitted to a long-range potential function which includes electrostatic, dispersion and induction terms. We found that, in addition to the dipole-dipole interaction between the dimers, which can be attractive (colinear) or repulsive (parallel), repulsive quadrupolar interactions result in barriers that can prevent molecules to approach each other at short distance, and thus stabilize ultracold samples. For the colinear geometry, the combination of attractive dipolar and repulsive quadrupolar interactions lead to long-range wells that can support several bound states. We explore how these wells can be controlled by external electric fields. Finally, we discuss the prospects of forming bound polymer chains of KRb molecules at ultra-cold temperatures as well as implications for controllable phase transitions such as 1-D gas to Luttinger liquid transitions.

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