

Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Ultracold nonreactive molecules in an optical lattice: connecting chemistry to many-body physics RICK MUKHERJEE, KEVIN EWART, SHAH ALAM, Rice University, MICHAEL WALL, JILA, NIST, University of Colorado, Boulder, ANDRIS DOČAJ, KADEN HAZZARD, Rice University — We derive effective lattice models for ultracold bosonic or fermionic nonreactive molecules (NRMs) in an optical lattice. In stark contrast to the standard Hubbard model, which is commonly assumed to accurately describe NRMs, we find that the single on-site interaction parameter U is replaced by a multi-channel interaction. The complex, multi-channel collisional physics is unrelated to dipolar interactions, and so occurs even in the absence of an electric field or for homonuclear molecules. We find a crossover between coherent few-channel models and fully incoherent single-channel models as the lattice depth is increased. We devise ways to control the effective model parameters using external fields and lattice anisotropy. We show that these parameters can be determined in lattice modulation experiments, which measure molecular collision dynamics with a vastly sharper energy resolution than experiments in an ultracold gas. We will report our progress calculating this novel model's ground state phase diagram.

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Date submitted: 29 Jan 2016

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