

Plenary Talk

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Quantum gas of polar molecules — •JUN YE — JILA, NIST and University of Colorado

Molecules cooled to ultralow temperatures provide fundamental insights for molecular interactions and chemical reactions in the quantum regime. Cold molecules also provide new experimental platforms to study strongly correlated quantum systems and facilitate precision test of basic laws of nature. Complete control of molecular interactions by producing a molecular gas at very low entropy and near absolute

zero has long been hindered by their complex energy level structure. Recently, a range of scientific tools have been developed to enable the production of molecular quantum gases, where collisions and reactions are controlled by quantum statistics of the molecules at the lowest collision channels. Furthermore, molecules can be confined in reduced spatial dimensions and their interactions can be precisely manipulated via external electromagnetic fields. The long-range dipolar interaction between spatially trapped molecules presents an interconnected spin system where correlated many-body dynamics can be explored.