BaF@Ar and the Electron Electric Dipole Moment

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Attempts to measure the electron Electric Dipole Moment (eEDM), d_e, have put an upper limit of 1.1×10^{-29} e cm = 5.3×10^{-21} D. The standard model of particle physics predicts that d_e is smaller than 5×10^{-30} D. Vutha, Hessels a and coworkers are building and experimental set up to measure d_e using a cold (10 K) Ar crystal doped with BaF. The hyperfine structure of BaF is perturbed by the interaction of the eEDM with the strong electric field of oriented BaF inside the Ar matrix. It can be probed with a carefully designed sequence of polarized laser and radio frequency pulses and an applied electric field to produce a signal proportional to d_e. We did CCSD(T) electronic structure calculations extrapolated to infinite basis set size for BaF, Ar_2, BaAr, Far and BaFAr to construct a potential function for the BaFAr system and help interpret future experiments. We will show potential energy curves, spectroscopic constants, and talk about their significance for the eEDM experiment. We will discuss a model of BaF embedded in crystalline Ar.