

Field-effect doping of C_{60} crystals: A view from theory

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The proposal of using the field-effect for doping organic crystals has raised enormous interest. To assess the feasibility of such an approach, we investigate the effect of a strong electric field on the electronic structure of C_{60} crystals. Calculating the polarization of the molecules and splittings of the molecular levels as a function of the external field, we determine up to what field-strengths the electronic structure of C_{60} is still essentially unchanged, so that one can speak of field-effect doping, in the sense of putting charge carriers into otherwise unchanged states. Beyond these field strengths, the electronic structure changes so much, that one can no longer speak of a doped system.

In addition we review proposed mechanisms for explaining an increase of the superconducting transition temperature in field-doped C_{60} that is intercalated with haloform molecules.