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Pinned Bilayer Wigner Crystals with Pseudospin Magnetism
YONG CHEN, Princeton University and National High Magnetic Field Lab — We study a model of *pinned* bilayer Wigner crystals (WC) and focus on the effects of interlayer coherence (IC) on pinning. We consider both a pseudospin ferromagnetic WC (FMWC) with IC and a pseudospin antiferromagnetic WC (AFMWC) without IC. Our central finding is that a FMWC can be pinned more strongly due to the presence of IC. One specific mechanism is through the disorder induced interlayer tunneling, which effectively manifests as an extra pinning in a FMWC. We also construct a general "effective disorder" model and effective pinning Hamiltonian for the case of FMWC and AFMWC respectively. Under this framework, pinning in the presence of IC involves *interlayer* spatial correlation of disorder in addition to intralayer correlation, leading to *enhanced* pinning in the FMWC. The pinning mode frequency (ω_{pk}) of a FMWC is found to decease with the effective layer separation, whereas for an AFMWC the opposite behavior is expected. An abrupt drop of ω_{pk} is predicted at a transition from a FMWC to AFMWC. Possible effects of in-plane magnetic fields and finite temperatures are addressed. Finally we discuss some other possible ramifications of the FMWC as an electronic supersolid- like phase. [1] Yong P. Chen, cond-mat/0507124

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