DIRECT MEASUREMENT OF CHARGE DENSUTY WAVE PINNING DYNAMICS USING X-RAY PHOTON CORRELATION SPECTROSCOPY

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Abstract

Using x-ray photon correlation spectroscopy (XPCS), we studied the structure and dynamics of the incommensurate charge density wave (CDW) in 1*T*-TaS2. We show that for a properly annealed system, CDW domains are stable against fluctuations. Correspondingly in two dimensions, CDW dynamics is independent of spontaneous phase changes. During annealing, a slow relaxation results in dynamical speckle patterns. We characterize the dynamics to be a CDW deformation under the action of internal stresses. In this regard, the CDW acts essentially the same as soft matters such as emulsions and gels. We determine that domain reconfiguration happens in a thermally activated fashion, where the large energy barrier is attributed to a collective effect due to impurity pinning. Comparing to transport and thermal experiments, our results describe a different behaviour in that relaxations are actually between CDW metastable states in the late time.