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**Emergence of coherence in the charge density wave state of intercalated 2H-NbSe2.**[1]

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Charge density waves (CDWs) are ubiquitous in condensed matter and associated with many exotic phenomena of great interest. This symmetry breaking state is described by a complex order parameter with an amplitude and a phase. In the conventional view of CDW formation, based on clean, weak-coupling systems, finite amplitude and long-range phase coherence set in simultaneously at a single temperature, the CDW transition temperature, but the situation may be dramatically different at strong coupling or in the presence of disorder. We have studied in detail the CDW formation in pristine and intercalated samples of 2H-NbSe2, a CDW material with strong electron-phonon coupling, combining structural (X-ray), spectroscopic (photoemission and scanning tunneling microscopy) and transport probes. In contrast to the conventional view, we find two separate characteristic temperature scales that can be widely separated. The higher crossover scale marks the onset of short-range CDW correlations, with non-zero amplitude and associated gap in the electronic spectra, but with an incoherent phase of the order parameter. The lower scale is a phase transition that marks the onset of global phase coherence and long-range CDW order. The observation of a persistent gap in the absence of long-range order and the absence of coherent excitations are strikingly similar to the characteristics of the pseudogap state observed in cuprate superconductors and other systems. Our observations thus emphasize the importance of phase fluctuations in strongly coupled CDW systems and provide new insights into the significance of phase incoherence in the realization of pseudogap phases.

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