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Analyzing topological defects in disordered charge density waves in transition-metal dichalcogenides $TaSe_2$ and TaS_2 using scanning tunneling microscopy DANIELLE SCHAPER, Department of Physics, Berea College, Berea, KY, 40404, USA, KYLE MCELROY, EDUARDO CALLEJA, Department of Physics, University of Colorado ar Boulder, Boulder, CO, 80309, USA, JIXIA DAI, Department of Physics and Astronomy, Rutgers University, Piscataway, NJ, 08854, LIJUN LI, WENJIAN LU, YUPING SUN, Key Laboratory of Materials Physics, Institute of Solid State Physics, CAS, Hefei 230031, China, XIANGDE ZHU, High Magnetic Field Laboratory, CAS, Hefei 230031, China — Charged ordered states are becoming a common feature in the phase diagrams of correlated materials. In many cased there are indications that doping controlled quantum critical points between the CO state and others are related to interesting properties including superconductivity. An interesting test case is the ordered 2D CDW found in the transition metal dichalcogenides. We performed an analytical study on the dichalcogenides tantalum disulfide (TaS_2) and tantalum diselenide ($TaSe_2$) to observe how CDWs present in the material can be melted as disorder is introduced into the system via copper doping. Data was taken using a scanning tunneling microscope (STM) below the transition to the CDW state, both with and without copper dopants added. The resulting topographs were then analyzed to investigate the relationship between the phase and the amplitude of the disordered CDW. We found that the copper doping caused disorder in the CDW state characterized by phase wanderings and 2π phase winding "point defects" in the CDW not present in the undoped parent compound. The locations of these point defects and windings were, in turn, found to have the characteristics of topological defects. Implications for studies of other disordered CO states seen in STM will be discussed.

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