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Influence of Ti doping on the incommensurate charge density wave in 1T-TaS_2[1] XIAOQIAN CHEN, Brookhaven National Laboratory, CHRISTOPHER NUGROHO, ANNA J. MILLER, ANSHUL KOGAR, EDUARDO FRADKIN, DALE J. VAN HARLINGEN, PETER ABBAMONTE, Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana-Champaign, YOUNG IL JOE, National Institute of Standards and Technology, JOEL D. BROCK, Cornell Univeristy, JOCHEN GECK, Leibniz Institute for Solid State and Materials Research — Using x-ray scattering and transport, we studied the temperature dependence of the transition between incommensurate (IC) and nearly commensurate (NC) phases of the charge density wave (CDW) in Ti doped $1T$-TaS_2. Our results showed a first order phase transition from IC to NC-CDW phase in all doping levels with decreased transition temperature, as Ti doping was increased. During this transition, the angle of the CDW in the basal plane rotates from 11.9^o at 0% Ti doping to 16.4^o at 12% Ti doping, while the in-plane component of the CDW wave vector does not change significantly. In addition, we observed that at 8% Ti doping, the CDW diffraction peak position and resistivity resemble that of pure TaS_2 in its commensurate CDW state. With our data, we revisit the resistive anomaly originally observed by DiSalvo [F. J. DiSalvo et al., Phys. Rev. B 12, 2220 (1975)] at 8% doping. DeSalvo explained this anomaly as arising from the pinning of the CDW on the crystal lattice. Our study shows that the commensuration effects in the NC phase is the cause of this anomaly.

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