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Emergent Metal in Disordered Two Dimensional Mott Insulator¹ OINAM NGANBA MEETEI, NANDINI TRIVEDI, Ohio State University, ELIAS LAHOUD, AMIT KANIGEL, Technion - Israel Institute of Technology — We show that disordering a two dimensional Mott insulator leads to an insulator-metal transition, even in the absence of any doping. For disorder strengths comparable to the interaction, the Mott gap closes and extended states develop at the chemical potential. Further increase in disorder drives the emergent metal into a gapless localized insulating phase. We make detailed comparisons of our theoretical predictions on the emergent metal with transport and APRES data on 1T-TaS₂ intercalated by Cu. The parent compound 1T-TaS₂ is a Mott insulator at low temperature (T < 180K). In the commensurate charge density wave (CCDW) phase, the "star of David" unit cells with 13 Ta atoms form a commensurate triangular lattice with a single half filled band crossing the Fermi energy. Strong interaction produces a Mott gap in the half filled band. Disorder introduced by intercalating Cu atoms between TaS_2 layers closes the Mott gap and drives the material into a metallic phase without destroying the CCDW order in good agreement with theory. Our work presents the first evidence of such an insulator-metal transition in a disordered two-dimensional Mott insulator.

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