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Hierarchical stripe phases in $IrTe_2$ driven by competition between Ir dimerization and Te bonding[1] WEIDA WU, JIXIA DAI, KRISTJAN HAULE, Department of Physics and Astronomy, Rutgers University, JUNJIE YANG, Laboratory for Pohang Emergent Materials and Department of Physics, Pohang University of Science and Technology, YOON SEOK OH, SANG WOOK CHEONG, Department of Physics and Astronomy, Rutgers University — Iridium di-telluride ($IrTe_2$) belongs to the family of transition metal dichalcogenides (TMD), but it distinguishes from the traditional TMDs due to the existence of multi-step single-q charge-density wave like phase transitions. Despite of intensive studies, there is still no consensus on the physical origin of the stripe phases or even the ground state modulation for this 5d material. In this study, we present atomic-resolving images and spectroscopic measurements from scanning tunneling microscopy and spectroscopy (STM/STS). We show that the ground state of $IrTe_2$ is a q=1/6 stripe phase, identical to that of the Se-doped compound. Furthermore, our data suggest that the multi-step transitions and the stripe phases are driven by the intralayer Ir-Ir dimerization that competes against the interlayer Te-Te bonding. This competition results in a unified phase diagram with a series of hierarchical modulated stripe phases.

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