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New insight into the Mott-insulating state in 1T-TaS_2 LIGUO MA, CUN YE, YIJUN YU, State Key Laboratory of Surface Physics and Department of Physics, Fudan University, Shanghai 200433, China, XIU FANG LU, Department of Physics, University of Science and Technology of China, Hefei, Anhui, XIAOHAI NIU, Fudan University, Shanghai 200433, China, SEJOONG KIM, Korea Institute for Advanced Study, Hoegiro 85, Seoul 02455, Korea, DONGLAI FENG, Fudan University, Shanghai 200433, China, DAVID TOMANEK, Physics and Astronomy Department, Michigan State University, YOUNG-WOO SON, Korea Institute for Advanced Study, Hoegiro 85, Seoul 02455, Korea, XIANHUI CHEN, Department of Physics, University of Science and Technology of China, Hefei, Anhui, YUANBO ZHANG, Fudan University, Shanghai 200433, China — In correlated materials, electron-electron and electron-phonon interactions are two major driving forces that stabilize various charge-ordered phases of matter. In layered compound 1T-TaS_2, the intricate interplay between the two generates a Mott-insulating ground state with a peculiar charge-density-wave (CDW) order. We explore a metastable CDW phase induced by voltage pulses, and find that the new phase exhibits electronic structures entirely different from that of the original Mott ground state. The metastable phase consists of nanometer-sized domains characterized by well-defined phase shifts of the CDW order parameter in the topmost layer, and by altered stacking relative to the layers underneath. We discover that the nature of the new phase is dictated by the stacking order, and few of the corresponding stacking is demonstrated. Our results shed fresh light on the origin of the Mott phase in 1T-TaS_2.

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