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Visualization of a stable intermediate phase in photoinduced metal-to-insulator transition in manganites[1] HANXUAN LIN, HAO LIU, YU BAI, TIAN MIAO, YANG YU, YINYAN ZHU, HONGYAN CHEN, YUNFANG KOU, JIEBIN NIU, WENBIN WANG, LIFENG YIN[2], JIAN SHEN[3], Fudan Univ
— First order metal-insulator transition, accounting for various intriguing phenomena, is one of the most important phase transitions in condensed matter systems. Aside from the initial and final states, i.e. the metallic and insulating phases, no stable intermediate phase has been experimentally identified in such first order phase transition, though some transient phases do exist at the ultrafast time scale. Here, using our unique low-temperature, high-field magnetic force microscopy with photoexcitation, we directly observed a stable intermediate phase emerging and mediating the photoinduced first order metal-insulator transition in manganites. This phase is characteristic of low net magnetization and high resistivity. Our observations unveil the microscopic details of the photoinduced metal-insulator transition in manganites, which may be insightful to study first order metal-insulator transition in other condensed matter systems.

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