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**Microscopic view of the reversibility of charge ordered insulating phase melting in manganites** HAO LIU, HANXUAN LIN, YU BAI, TIAN MIAO, WENBIN WANG, YINYAN ZHU, LIFENG YIN, JIAN SHEN, Fudan University — In colossal magnetoresistive manganites, it has been well known that charge-ordered insulating (COI) phase can be melted by high magnetic field and transits into ferromagnetic metallic (FMM) phase. The reversibility of the field-driven COI to FMM phase transition, however, has not been well studied. In this work, we use magnetic force microscopy (MFM) mounted with both hard and soft magnetic tips to investigate the melting process of the COI phase in epitaxial  $\text{La}_{0.325}\text{Pr}_{0.3}\text{Ca}_{0.375}\text{MnO}_3$  (LPCMO) thin films and its reappearance after the field is removed. At metal-insulator transition temperature or above, we observe that the COI melting is largely reversible indicating that the electronic phase separation state dominates. The melting of the COI phase becomes irreversible and the FM phase appears to be stable at low temperatures. The results of MFM images are in good agreement with the transport and magnetic measurements.

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