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Superconductivity driven by orbital rearrangement in La_2CuO_4 YOSHIHARU KROCKENBERGER, BENNETT ELEAZER, HIROSHI IRIE, HIDEKI YAMAMOTO, NTT Basic Research Labs — La_2CuO_4 is known as the parent compound of hole-doped high temperature superconductors. In La_2CuO_4 , Cu and O ions form CuO_2 planes in which superconductivity takes place. It is also known that those Cu ions are octahedrally coordinated with strongly stretched octahedrons along the c-axis of the unit cell owing to the Jahn-Teller effect. Such a system is an antiferromagnetic insulator and superconductivity is induced by hole doping, e.g. Sr or Ba. The arrangement of O around Cu can be altered into a squareplane by state-of-the-art thin film growth techniques thus leaving both of the apical sites vacant. We show that the conversion from La_2CuO_4 with octahedral coordinated copper into square-planar coordinated copper triggers an insulator-to-metal transition. This insulator-metal transition is induced via an orbital rearrangement that takes place due to reconfigured oxygen sublattices. More importantly, the metallic La_2CuO_4 with square-planar coordinated copper shows a superconducting transition at 28 K which is essentially identical to Nd_2CuO_4 or Pr_2CuO_4 . These results emphasize that the parent compounds of electron-doped cuprate superconductors are superconducting per se.

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