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Superconductivity in the infinite-layer $Sr_{1-x}Ca_xCuO_2$ phase YOSHIHARU KROCKENBERGER, AI IKEDA, HIDEKI YAMAMOTO, NTT Basic Research Labs — The CuO_2 planes are the fundamental building blocks of cuprate superconductors where Cu assumes three types of copper coordinations, i.e., octahedral, pyramidal, and square-planar. For cuprates with the infinite layer structure, Cu is stabilized in a square-planar environment and this structure is known to show superconductivity. The square-planar coordination is also known to cuprates with Nd_2CuO_4 structure and we have shown earlier that doping is not a relevant parameter in inducing superconductivity, quite in contrast to cuprates with octahedral- or pyramidal coordinated copper. Moreover, for cuprates with infinite-layer structure the induction of superconductivity has been associated to reconstruction processes rather than doping in $CaCuO_2/SrTiO_3$ superlattices. Here we show that the superconductivity in $Sr_{1-x}Ca_xCuO_2$ is predominantly subject to defects arising either from cation- and/or oxygen- disorder. Using molecular beam epitaxy we synthesized high quality single crystalline thin films with 100 nm thickness of $Sr_{1-x}Ca_xCuO_2$. High angle annular dark field scanning transmission electron tomographs are used to link the degree of cation disorder in this thermodynamically unstable phase to the induction of superconductivity

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