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Formation of highly-conductive SrTiO_{3-δ} by pulsed laser deposition of TiO₂ on SrTiO₃ substrate KUNITADA HATABAYASHI, Department of Chemistry, University of Tokyo, TARO HITOSUGI, Department of Chemistry, University of Tokyo / Kanagawa Academy of Science and Technology (KAST), YUTAKA FURUBAYASHI, YASUSHI HIROSE, Kanagawa Academy of Science and Technology (KAST), TOSHIHIRO SHIMADA, TETSUYA HASEGAWA, Department of Chemistry, University of Tokyo / Kanagawa Academy of Science and Technology (KAST) — We report on formation of highly conductive SrTiO_{3-δ} by pulsed laser deposition of TiO₂ on SrTiO₃ substrate under relatively reducing atmosphere. Anatase TiO₂ thin films were grown on SrTiO₃(001) and (LaAlO₃)_{0.3}(Sr₂AlTaO₆)_{0.7} (LSAT)(001), for comparison, by pulsed laser deposition under oxygen pressure of $P_{O_2} = 5 \times 10^{-8}$ Torr. In-situ RHEED (reflection high energy electron diffraction) measurements during film deposition revealed a clear streak pattern of 4x1 reconstruction, indicating growth of high quality anatase (001) films. Meanwhile, the anatase (001) films deposited on LSAT with thickness of >2 nm showed spotty RHEED patterns, indicating formation of oxygen-poor TiO_{2-x}. These facts lead us to a conclusion that oxygen atoms in SrTiO₃ substrate diffuse into anatase TiO₂ during the film growth process. In the TiO₂/SrTiO_{3-δ} heterostructure, we observed high mobility of 1×10^4 cm²/Vs (5K) and Shubnikov-de Haas oscillation (0.5K), proving formation of clean SrTiO_{3-δ} without structural deformation.

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