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**Atomically Flat $SrRuO_3$ Conductive Thin Films on $SrTiO_3$ (001) by Pulsed Laser Deposition** YUDI WANG, SOO GIL KIM, I-WEI CHEN, Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia, PA19104-6272, USA — Atomically flat surfaces are important for thin film multilayers, superlattices, and heterostructures. For $SrRuO_3$ thin films grown on perovskite substrates, higher oxygen pressure is commonly used to achieve desired stoichiometry, crystallinity and conductivity, but it can also cause step bunching, pin holes and finger-like structures which destroy film/substrate coherency. We have found the finger-like structure is due to the slow 3-layer-nucleation process that occurs on the $TiO_2$ terminated $SrTiO_3$substrate, whereas step bunching is due to excessive step mobility. Using a transition layer on $SrTiO_3$ that establishes the SrO termination, and adjusting deposition parameters and step spacing that reduce step migration time, we have obtained atomically flat $SrRuO_3$ films free of the above morphological defects. These films show a large enhancement of electrical conductivity, making them suitable for various applications.

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