Exploring the Ferroelectric Oxide Thin Films Using Transmission Electron Microscopy

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Ferroelectic oxide thin films have promising applications for ferroelectric memories, microwave devices, actuators and sensors, magnetic field detectors etc. Transmission Electron Microscopy (TEM) has been crucial for the understanding and development of semiconductor thin films and the same holds for the ferroelectric thin films. Using conventional and high resolution TEM analysis of $PbSc_{0.5}Ta_{0.5}O_3$ and $Ba_{0.7}Sr_{0.3}TiO_3$, the common crystal defects like misfit and threading dislocations as well as the not so common planar defects, in epitaxial perovskite films grown by pulsed laser deposition on perovskite substrates will be presented. Mechanisms for the generation of these defects will be discussed. The remarkable application of the recently invented spherical aberration corrected TEM for the understanding of the ferroelectricity in thin films on the atomic scale, reported in the recent literature, will be pointed out.

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