Influence of substrate in the structural disorder of $SrSnO_3$ thin films deposited by pulsed laser deposition

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$MSnO_3$ (M = Ca, Sr, or Ba) perovskites are of particular interest due to their unusual dielectric and semiconducting properties, leading to various applications [1,2]. In this work, $SrSnO_3$ thin films were prepared by pulsed laser deposition between 600 and 700 ^oC on amorphous silica and on single crystal substrates (R-sapphire, (100)$LaAlO_3$ and (100)$SrTiO_3$). Characterizations were done by X-ray diffraction (θ-2θ, ω- and φ- scans), Scanning Electron Microscopy, Atomic Force Microscopy, Micro-Raman spectroscopy and photoluminescence (PL). According to literature data, Raman spectra of orthorhombic $SrSnO_3$ shows active modes at 119, 150, 168, 220, 257, 305, 403, 511, 596, 713 and 890 cm^{-1} [1]. However, the Raman spectra of the $SrSnO_3$ films obtained in the present work did not present these modes, showing only peaks assigned to the substrates (Figure 1a). We believe that this behavior was related to the high quality of the (100) epitaxial films obtained on $LaAlO_3$ and $SrTiO_3$ (Figure1b), which indicated that these materials presented cubic structure, with a high symmetry degree in short and long range. These films did not show PL emission confirming this assignment. Textured films on R-Sapphire and disordered ones on silica did not present peaks in Raman spectra, but exhibited PL emission at about 450 and 500 nm, respectively, indicating that some disorder occurred at short or medium range.

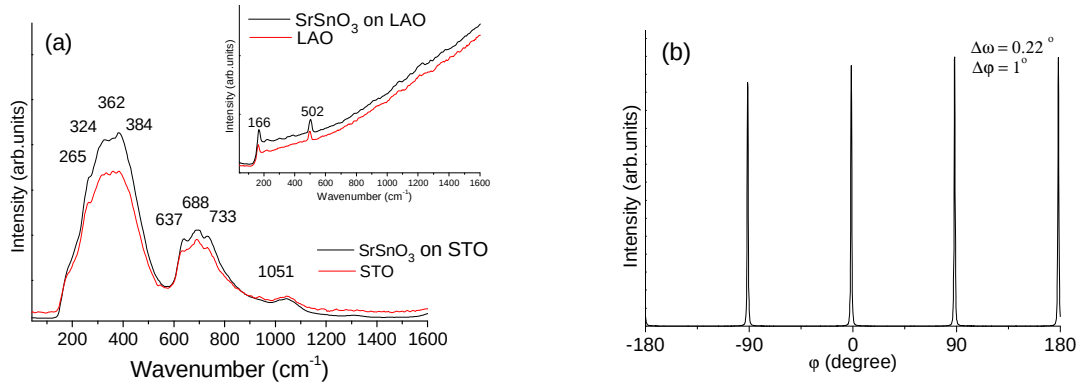

Figure 1: (a) Micro-Raman Spectra of $SrSnO_3$ thin films on different substrates (b) φ-scan XRD pattern performed on (220) $SrSnO_3$ reflection of the film deposited at 700°C on (100)STO.

Keywords: perovskite, stannate, thin films, Raman, epitaxial growth

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