

Structural analysis of layered double perovskites $\text{La}_2\text{CuSnO}_6$ by HAADF-STEM

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In this study, structural observation of double perovskites oxide $\text{La}_2\text{CuSnO}_6$ (LCSO) was performed by using high-angle annular dark-field (HAADF) imaging with a scanning transmission electron microscope (STEM). In the majority of double perovskites oxides ($\text{A}_2\text{BB}'\text{O}_6$), B and B' cations are arranged in the rock-salt configuration, whereas Cu^{2+} and Sn^{4+} are arranged in a layered configuration only in $\text{La}_2\text{CuSnO}_6$ as an ambient pressure phase. The layered crystal structure model determined by x-ray analysis is shown schematically in Fig. 1. The layered double perovskites $\text{La}_2\text{CuSnO}_6$ films were grown heteroepitaxially on SrTiO_3 (STO) substrates by a pulsed laser deposition technique. The substrates were treated with NH_4F -HF (BHF) solution, leading to a TiO_2 terminated flat surface with a step and terrace structure of about one unit cell high.

Figure 2 shows a HAADF image observed from an interface between LCSO and STO substrate. Since the STO substrate is terminated with the TiO_2 surface, the LCSO is growing firstly by La layers. The second layer from the interface in LCSO film is almost formed with Cu atomic layer in the terrace of the substrate. However, there are some irregular structures, which are the impurity of La_2CuO_4 crystal and the ordering of Cu and Sn layers was shifted each other, near steps on the substrate surface. Therefore, these observations demonstrate that the existence of steps severely affects the growth of $\text{La}_2\text{CuSnO}_6$ thin film.

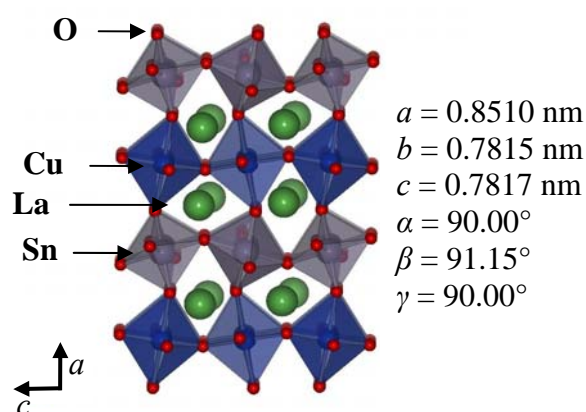


Figure 1. A layered structure model of $\text{La}_2\text{CuSnO}_6$.

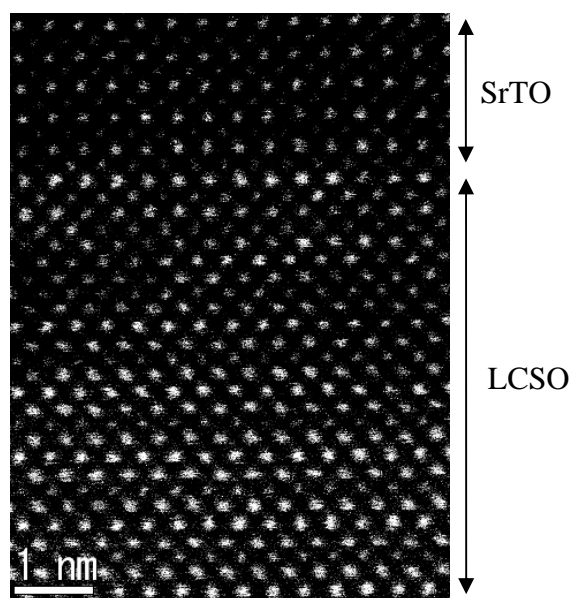


Figure 2. HAADF-STEM image of the interface between $\text{La}_2\text{CuSnO}_6$ and SrTiO_3 .