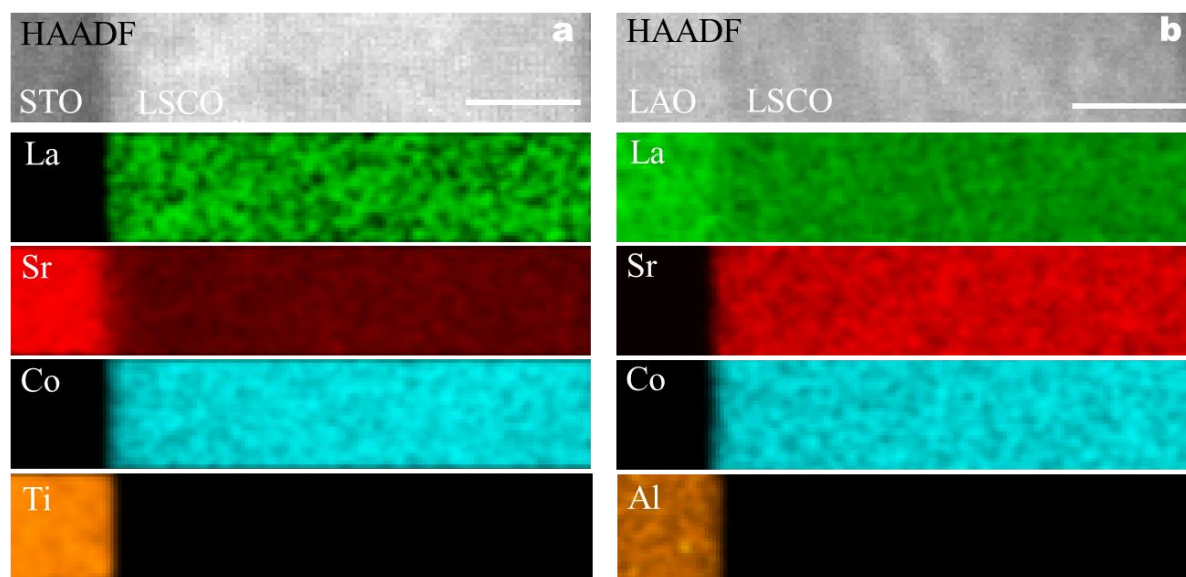
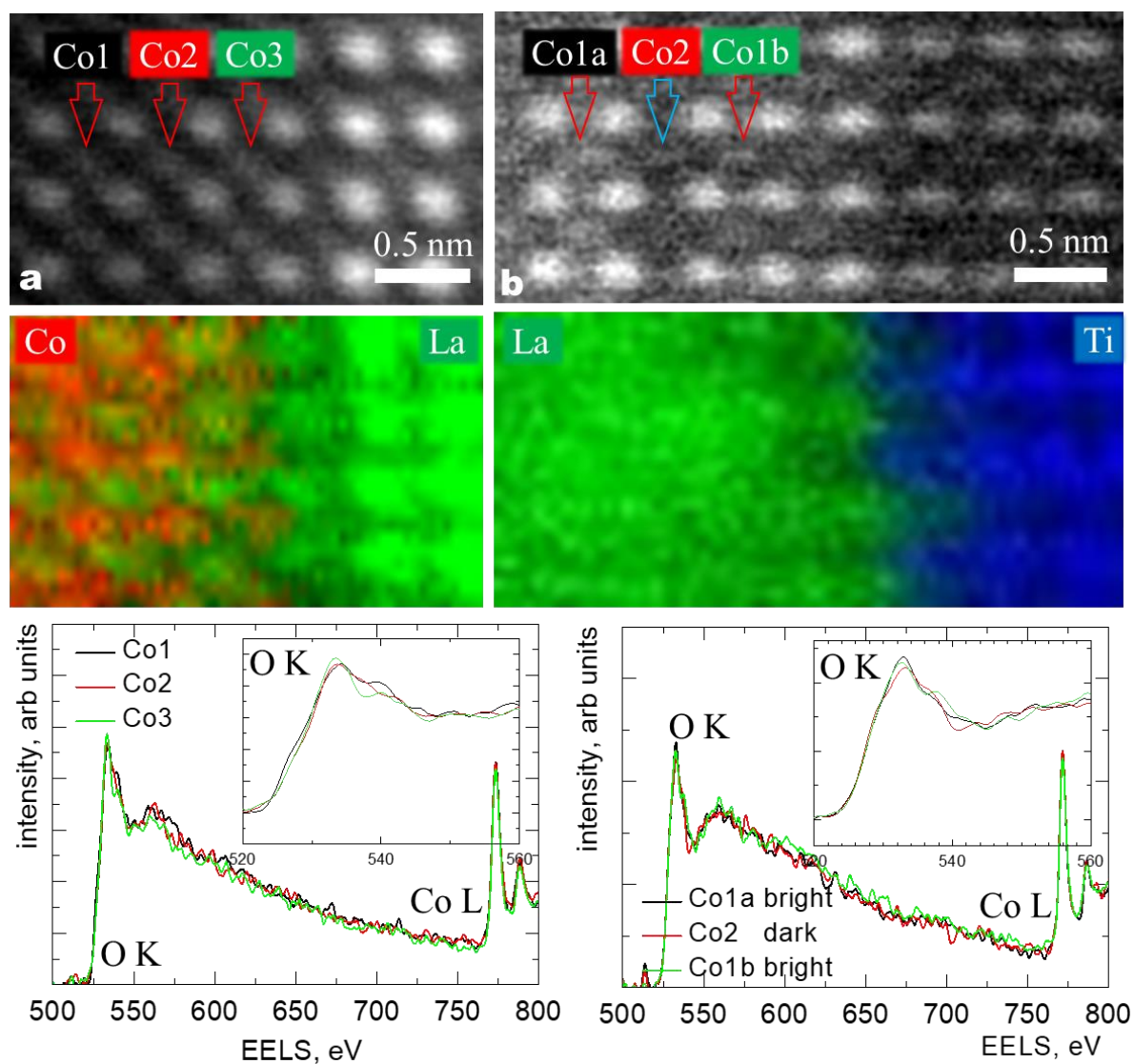


EDX study



Supplementary Figure 1. HAADF images and corresponding EDX maps of the LSCO64 thin films deposited on (a) STO and (b) LAO substrates. The compositional maps demonstrate atomically sharp interfaces with the substrates in both cases. There are no any segregations of constitute elements.

EELS study



Supplementary Figure 2. HAADF images and corresponding EELS maps of the LSCO64 thin films deposited on (a) LAO and (b) STO substrates. At the bottom of the figure the EELS spectra for the selected Co atomic rows (shown on the top part of the figure) are shown.