Epitaxial La0.7Sr0.3MnO3 thin films on silicon with excellent magnetic and electric properties by combining physical and chemical methods

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# Supporting Information

**High temperature stability of STO buffer layers on Si**

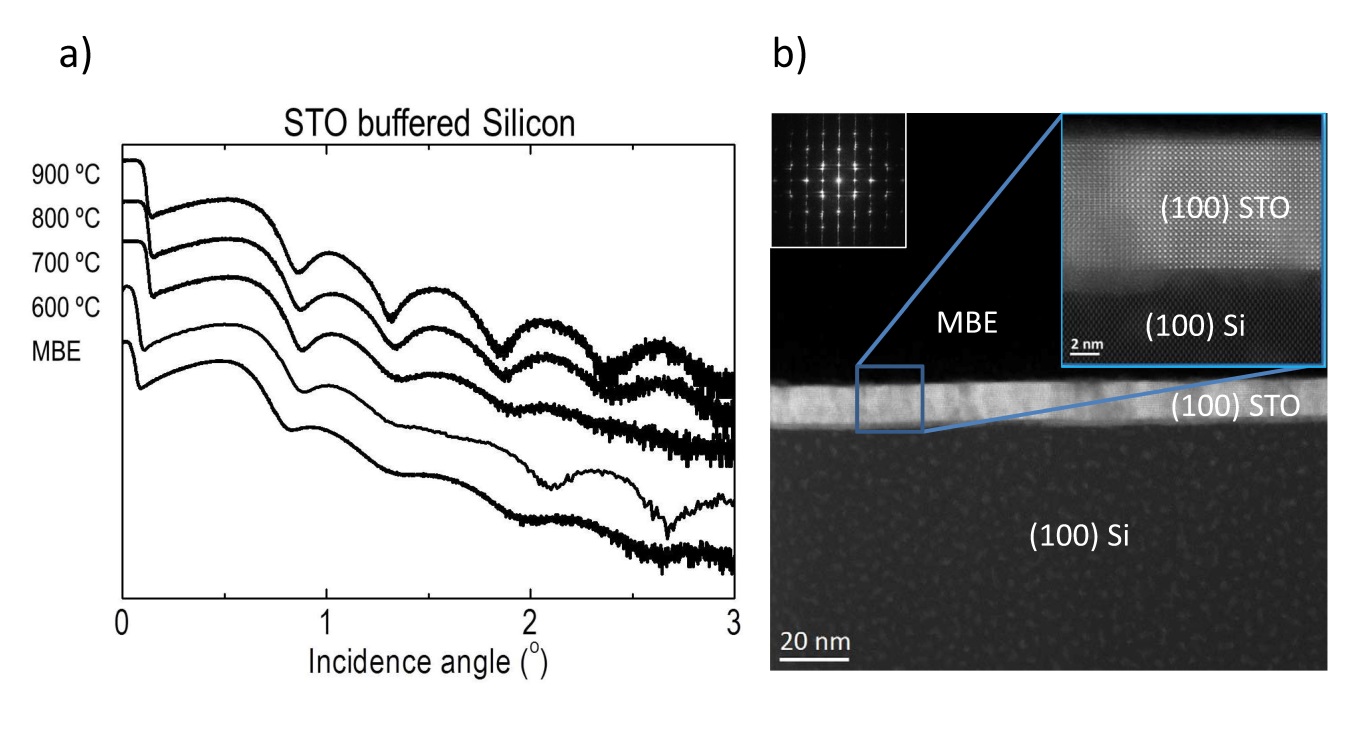


Figure S1. a) XRR curves of STO/Si substrates. STO-buffered Si substrates were annealed at 600ºC, 700ºC, 800ºC, and 900 ºC in air during 2h. b) Low and high resolution STEM images of non-annealed epitaxial STO film on Si substrate grown by MBE.

**Growth of LSMO films on top of non-annealed STO/Si substrates**

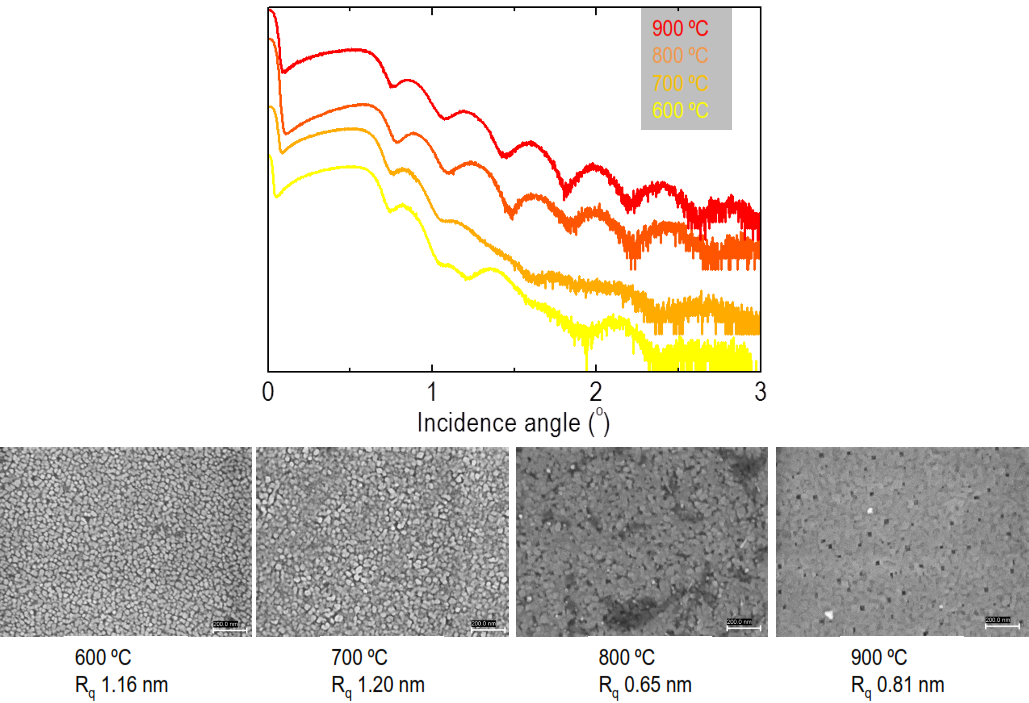


Figure S2. XRR curves for LSMO films deposited on non-annealed STO-buffered Si substrates at 600ºC, 700ºC, 800ºC, and 900ºC in air during 2h. The Rq values obtained by AFM are 1.16, 1.20, 0.65, and 0.81 nm, respectively.

**Chemical analysis of the interface LSMO-STO**

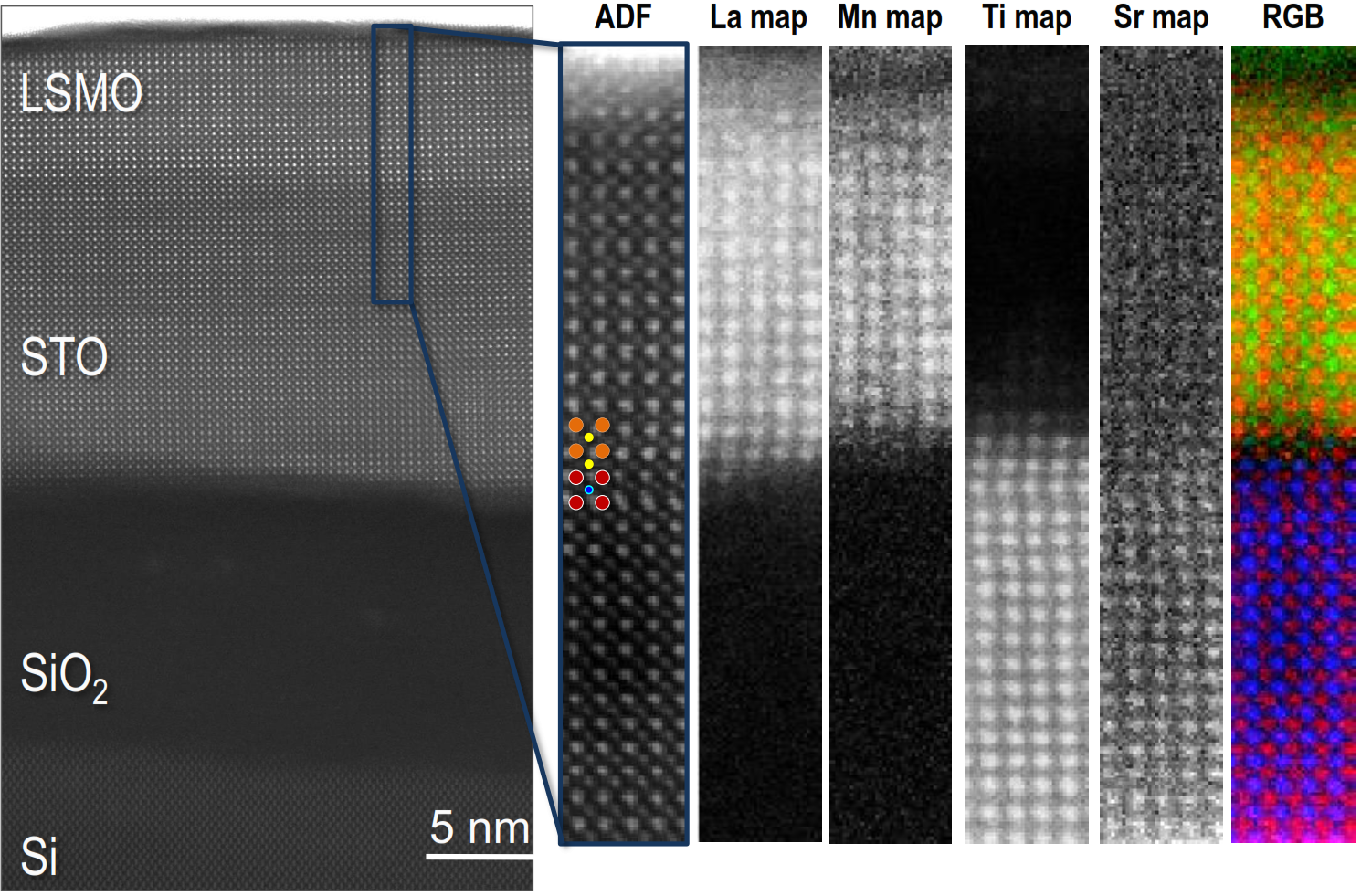


Figure S3. EELS analysis for Lanthanum, Manganese, Titanium, and Strontium of the LSMO-STO interface in the LSMO/STO/Si heterostructure.

**Low magnification of cross-sectional TEM image of the** **LSMO/STO/Si nanostructure**

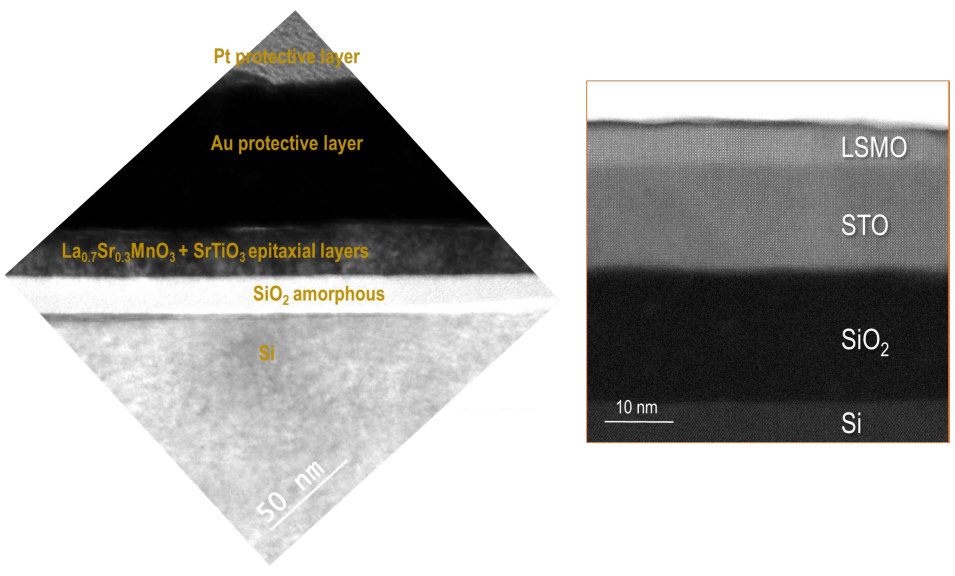
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Figure S4. Low magnification cross-sectional TEM image of a specimen lamella of the LSMO/STO/Sinanostructure.

**Crystallographic orientation of the LSMO/STO layers with respect to Silicon substrate**

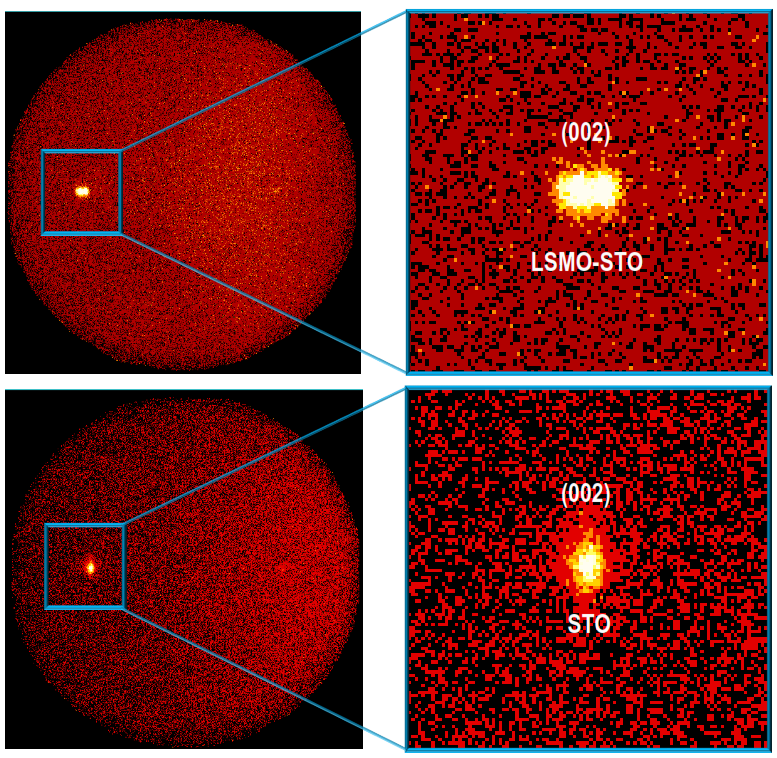


Figure S5. 2D XRD pattern (from 18º to 52º) for a LSMO/STO/Si layer (up) and a preannealed STO/Si layer (bottom).

**Magnetotransport characterization**

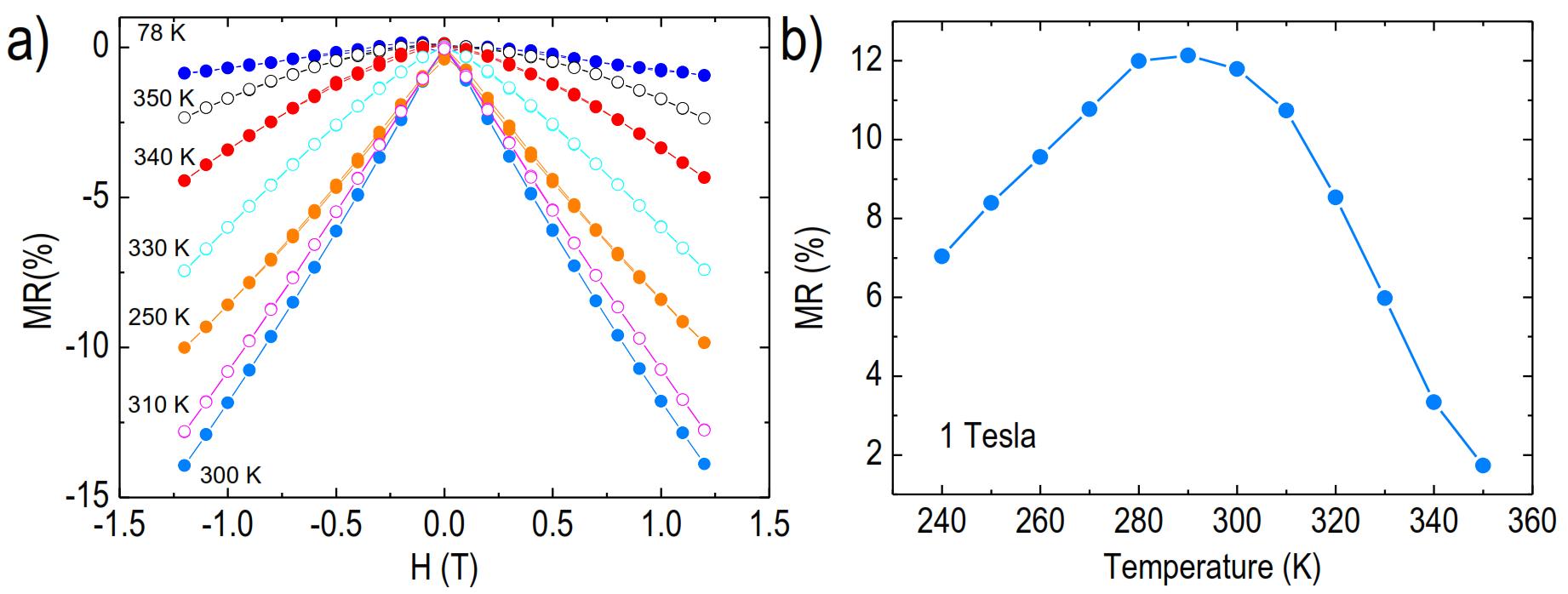


Figure S6. a) Magnetoresistance at 78, 250, 300, 310, 330, 340 and 350 K for LSMO/STO/Si b) Temperature dependence of the MR at 1 T around the MIT extracted from MR characterization from 240 to 350 K.

Table S1. Surface roughness obtained from AFM measurements and XRR fittings of the MBE STO-buffered Si substrates annealed at different temperatures.

|  |  |  |
| --- | --- | --- |
| **MBE SrTiO3 buffered Si substrate** | **Roughness Rq AFM (nm)** | **Roughness XRR (nm)** |
| 900ºC | 1.00 | 0.73 |
| 800ºC | 0.97 | 0.61 |
| 700ºC | 0.87 | 0.72 |
| 600ºC | 1.03 | 0.79 |
| MBE as deposited | 1.49 | 0.73 |