Study and Characterization of SrTiO3 Surface

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Abstract. Two-dimensional electron gas (2DEG) at an oxides interfaces and surfaces has attracted large attention in physics and research due to its unique electronic properties and possible application in optoelectronic and nanoelectronic. The origin of 2DEG at oxide interfaces has been awarded to well known "polar catastrophe" mechanism. On the other hand, recently 2DEG has been also found on clean $SrTiO_3$(001) surface due to the creation of oxygen vacancies. However, these 2DEG systems have been until now found mostly on an atomically perfect crystalline samples usually grown by pulse laser deposition or molecular beam epitaxy e.g. samples which are difficult to be prepared and require specific experimental conditions. Here, we report on the fabrication of $SrTiO_3$ thin films deposited by magnetron sputtering which is suitable for mass-production of samples adapted for naoelectronic applications. The characterization of their structural and electronic properties were studied and compared to those of $SrTiO_3$ single crystal. XRD patterns and SEM micrography showed that the deposited films are amorphous and their structure changed to polycrystalline after heating at 900◦C. Photoemission spectroscopy (XPS and UPS) were used to study the electronic properties of the films and crystal. In both, we observed the 2DEG system at Fermi level and the formation of Ti^{3+} state when the surface was heated at 900◦C.