An X-ray magnetic circular dichroism study of the interface Magnetism in titanate Heterostructures

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The 2D-electron system (2DES) created at the interface between LaAlO$_3$ and SrTiO$_3$ have attracted strong interest in recent years. This system shows an intriguing inversion the Ti3d bands hierarchy at the interface respect the bulk [1], and some reports even suggested coexistence between ferromagnetism and superconductivity [2]. By using x-ray magnetic circular dichroism we show that oxygen vacancies induce magnetic interfacial localized Ti3+ states, which couple to the 2DES, with a negative exchange interaction. The magnetic dichroism signal is quenched in standard LAO/STO interfaces annealed in high oxygen pressure after the deposition and showing a homogeneous superconducting ground state [3], suggesting a decisive role of oxygen vacancies in the magnetism of these oxide interfaces [4,5].


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