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Temperature Dependence of Strain-Induced Modulation on Magnetic and Orbital Properties in Ferromagnetic Insulating La0.88Sr0.12MnO3 Thin Films

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The functional perovskite La1-xSrxMnO3 (LSMO) is extensively researched for its applications in green-energy storage, high-temperature oxygen sensors, catalysts, and memory devices. LSMO exhibits various exotic phases due to competing physical parameters and internal degrees of freedom. Notably, the ferromagnetic insulating (FMI) phase of LSMO has been less studied compared to its ferromagnetic metallic phase. To examine the relationship between crystal structure and magnetism in FMI LSMO, La0.88Sr0.12MnO3 thin films were grown on two different substrates, (001) SrTiO3 and (001) (LaAlO3)0.3(Sr2AlTaO6)0.7, using pulsed laser deposition. The strain-induced effects with temperature dependence on magnetic and orbital properties were investigated using X-ray magnetic circular dichroism (XMCD) and X-ray linear dichroism (XLD) measurements. XMCD results showed a decrease in the absolute values of XMCD with increasing temperature in both systems, consistent with previous SQUID magnetization measurements. As temperature rose, the spin magnetic moment (ms) exhibited relatively larger changes compared to the orbital magnetic moment (mo), indicating a dominant spin contribution to the temperature dependence of XMCD. These findings underscore the importance of strain engineering in tuning the magnetic and orbital properties of LSMO thin films. The strain-tuned structure-property relationship of FMI LSMO plays a crucial role in manipulating properties in the FMI regime, paving the way for the development of advanced functional materials for future electronic devices

Paper submission Plan

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Best Presentation

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Contribution track

ICABU WG4. Applications of Particle Beams

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