Magnetism and electrochemical activities of epitaxial La_2NiMnO_6 thin films

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Novel thin film materials are gaining interest due to promising catalytic application possibilities. Therefore, finding and being able to grow and modify new thin film catalyst materials is essential to ensure a more sustainable future [1]. With novel hybrid Pulsed Laser Deposition (PLD) methods, which combine classic PLD and Molecular Beam Epitaxy (MBE) techniques, we aim to design-engineer thin films to achieve this goal. This work will present the deposition of La_2NiMnO_6 thin films by means of hybrid PLD. Double perovskites such as La_2NiMnO_6 are a promising material class for electrocatalyst application for the oxygen evolution reaction (OER) [2] [3].

Perovskite materials are a versatile material group with a particularly interesting interplay of electronic, structural, and magnetic degrees of freedom [1], whereas the double perovskite La_2NiMnO_6 represents an auspicious example of this. It has been previously reported that La_2NiMnO_6 powder samples show a comparatively high OER activity when a vibronic magnetic superexchange interaction dominates instead of a static exchange interaction [4]. However, the true origin of activity performance and magnetic properties have yet to be related since a low-temperature Curie temperature due to vibronic superexchange interaction between Ni^{3+} and Mn^{3+} has also been linked to originating from defects such as oxygen vacancies [2]. Therefore, we systematically investigated epitaxial films with controlled anion vacancies to study the influence of modified magnetic properties on the OER performance and correlate the bulk magnetic properties with their surface-sensitive OER activity.

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