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Thin film fabrication for users: Possibilities and perspectives

Monday, 20 March 2023 16:00 (2 hours)

JCNS at MLZ offers the opportunity for thin film fabrication in combination with neutron investigation proposals utilizing a Molecular Beam Epitaxy (MBE) setup on site.
The design of the MBE setup will be presented revealing its versatility with respect to the fabrication of different material compositions of thin films like "classical"magnetic thin films, transition metal oxide heterostructures or thin metal films for soft matter studies, acting as defined surfaces.
Examples like $SrCoO_x$, Fe_4N or [Pt/Co/Ta] multilayers will be discussed. The focus lies on stoichiometry, morphology and thickness precision and detailed information about the possibilities and constraints in sample fabrication for users will be given.

For quasi in-situ neutron reflectometry of thin films, which are sensitive to ambient air, a small versatile transfer chamber is may be used for sample transfer from the MBE setup to the neutron reflectometer MARIA and measurement under UHV conditions. [1]

Recently, we have utilized 50 nm thick niobium films fabricated at the JCNS lab to perform neutron reflectometry experiments during hydrogen loading. The momentum-space position of the prominent waveguide resonance allows tracking of the absolute hydrogen content with an accuracy of about one atomic percent on a timescale of less than a minute. [2]

[1] A. Syed Mohd et al. Rev. Sci. Instrum., 87, (2016) 123909
[2] L. Guasco, et al. Nature Comm. 13 (2022) 1486

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