# NANOSCIENCE COLLOQUIUM

## Functional Materials by MBE: The Case Study of Strongly Correlated Oxides

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**Abstract**:Maturing the thin film growth of emerging materials to reduce the level of defects is a mandatory prerequisite to study their intrinsic physics and to innovate new device functionalities. While this has been done with remarkable success in various traditional semiconductor materials using molecular beam epitaxy, ranging from monoelemental Group IV, to Group III-V all the way to Group II-VI compound semiconductors, it has been found challenging to expand beyond binary oxides, such as ZnO or MgO. In particular, in complex oxide materials containing two or more cations, which includes the functional oxides with perovskite structure have been proved notoriously difficult to minimize point defect concentration. This provokes the question: Can we even achieve semiconductor-grade quality perovskite oxide thin films?
In this talk I will introduce the fundamental challenges utilizing a conventional molecular beam epitaxy approach for the growth of complex oxides and present an alternative – a hybrid synthesis approach – as a potential way out to overcome existing challenges. Promising results obtained by hybrid oxide MBE will be presented along with the most recent advances in materials quality achieved in complex oxides thin films with perovskite structure. The application potential of correlated oxides as alternative to replace conventional transparent conductor materials will be highlighted and n outlook will be given about the possibility to scale up this growth approach to larger substrates and higher growth rates, rendering its potential relevance in an industrial setting.

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