# In-situ x-ray characterization of thin films at high temperatures

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In this presentation, our state-of-the-art in-situ x-ray characterization methods for optical thin films will be introduced. Before analysis, the single and multilayers were prepared by magnetron sputtering in our in-house designed ultra-high vacuum chamber. Layer properties such as thickness were measured and controlled by x-ray reflectometry (XRR). The in-situ XRD annealing chamber allows the temporal investigation of structure, grain size and phases. In high vacuum, we can anneal up to 2000 °C. Thin-film metamaterials, which are interesting as selective emitters in optical elements for thermophotovoltaics [1], were examined at their working conditions to validate thermal endurance. Another furnace for temperatures up to 1200 °C and various atmospheres in fine vacuum enables us to investigate nanocrystalline compound layers to investigate their phase stability, especially the phase separation of a supersaturated alloy under different gas atmospheres.

[1] G.V. Krishnamurthy*, M. Chirumamilla*, T. Krekeler, M. Ritter, R. Raudsepp, M. Schieda, T. Klassen, K. Pedersen, A. Yu Petrov, M. Eich and M. Störmer, Iridium based selective emitters for thermophotovoltaic applications, Advanced Materials, accepted 16 August 2023 https://doi.org/10.1002/adma.202305922