In situ probing of the growth, structure, and surface chemistry of ultrathin ceria films by low-energy electron microscopy

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Cerium oxide is of considerable importance for a wide range of technological applications including, e. g., energy harvesting, storage, and conversion, chemical sensing, and heterogeneous catalysis. Epitaxially grown ceria thin films and nanostructures represent important model systems allowing for the investigation of their peculiar materials properties using surface science methodology. In this presentation, I will focus on the growth and characterization of cerium oxide ultrathin films and microparticles on transition metal surfaces and the subsequent monitoring of their structural and chemical modifications in reactive environments using low-energy electron microscopy and related methods [1]. Using the frequently employed ceria/Ru(0001) [2] and ceria/Pt(111) [3] inverse model catalysts as primary examples, it will be demonstrated that nanoscale structural transformations that occur upon chemical reduction, thermal annealing, or reoxidation can be followed in real-time [4-6].

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