Cerium oxide (*ceria*) is widely used catalytic material known for its oxygen storage capacity. Iron-modified ceria-based catalysts find applications in various reactions, such as the oxidation of CO or NO. However, the existing knowledge about these catalysts is limited to relatively undefined powder samples. The aim of this Bachelor's thesis is to create well-defined model surfaces of iron oxide on ceria and characterize these surfaces using various methods such as Scanning Tunneling Microscopy (STM), Atomic Force Microscopy (AFM), X-ray Photoelectron Spectroscopy (XPS), and Low-Energy Electron Diffraction (LEED).

In our work we found the following procedure for preparing the FeO(111)/ $CeO_2(111)$ surface on the Cu(111) substrate: Initially, metallic Fe is deposited onto the surface of $CeO_2(111)$ at room temperature, followed by annealing in ultra-high vacuum (UHV) up to 700 K. At room temperature, iron tends to form clusters consisting of both neutral Fe^0 and ionic Fe^{3+} or Fe^{2+} states. After annealing in UHV up to 700 K, iron gets fully oxidized, resulting in the formation of a 2D FeO layer. This process gives rise to a moiré pattern observed in STM and LEED due to the overlay of the FeO and CeO_2 lattices. By measuring the parameters of the moiré pattern, the periodicity and orientation of the deposited FeO layer on CeO_2 are determined to be $a_{\mathrm{FeO}}^{(111)} = (0,31 \pm 0,01)$ nm and $\alpha = (6 \pm 1)\,^\circ$.