Desorption dynamics of LAO-oxide nanostructures

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Local anodic oxidation (LAO) using an atomic force microscope allows the modification of a sample surface on the nanometer scale taking advantage of the unique possibilities of scanning probe microscopy. In order to gain a deeper insight in the local structural and chemical properties of the AFM-grown oxide, we performed time-resolved photoemission spectroscopy on GaAs oxide nanostructures by employing spectroscopic photoemission and low energy electron microscopy (SPELEEM) with high energy (250 meV) and lateral resolution (30 nm). We found a strong desorption effect due to the irradiation of the oxide patches with extreme ultraviolet light (130 eV = 9.5 nm). A time-resolved study of the AFM-grown oxide reveals that in the early stage of light exposure, the As-oxide desorbs leaving an oxide mainly composed of Ga-oxides. Moreover, a lineshape analysis of the Ga 3d core level shows that the Ga-oxide has a dominant component related to Ga_2O.