Oxidic Quasicrystals: What do we learn from Scanning Probe Microscopy?

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In this talk the current understanding of dodecagonal quasicrystals based on oxide thin films grown on different close-packed transition metal surfaces will be discussed[1-6]. Special emphasis will be given to the wealth of information obtainable by scanning tunneling microscopy (STM) and non-contact atomic force microscopy (AFM). Both techniques allow for atomically resolved imaging of the aperiodic structure and identify the peculiar building blocks -- triangle, square and rhombus – that form the twelve-fold quasicrystal. Furthermore the local microscopy allows for a detailed statistical analysis of these building blocks and any deviation from a mathematical ideal quasicrystal.

The Fourier transform of atomically-resolved large-scale STM images agrees very well with the twelve-fold diffraction patterns obtained by low-energy electron (LEED) or surface X-ray diffraction (SXRD)[1-3]. However, there is important structural information beyond STM and AFM that can be retrieved by a full analysis of SXRD only. This additional information will be used to present a full structural model of the oxide quasicrystal.

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