Quantitive Morphological Characterization of Nanostructure Arrays by scanning Probe Microscopy

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Due to the imaging principle in Scanning Probe Microscopies as Scanning Tunneling Microscopy and Atomic-Force Microscopy (AFM), the recorded image represents a topographical information z(x,y) of the surface under investigation. Provided a well calibrated scanner and a sufficiently sharp probe, the three-dimensional shape and size of nanostructures can be determined with high precision. Besides analysis of individual structures, ensembles of nanostructures can be analyzed with respect to size and separation distributions applying power spectral density analysis of the recorded images. For epitaxial nanostructures with well defined facets, integral information on preferential facet orientations can be obtained by calculating histograms of local surface normals from z(x,y). These procedures will be demonstrated for quantitative analysis of self-organized nanostructure arrays in semiconductor homo- and heteroepitaxy [1,2] as well as for ion-bombardment induced pattern formation [2,3].

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