MAPEX Bremen
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02
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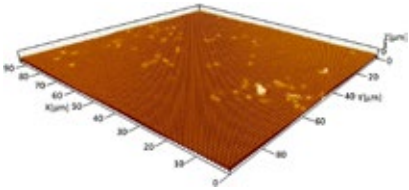
INSTRUMENT DATABASE
Chemical imaging of rough surfaces

Universität Bremen

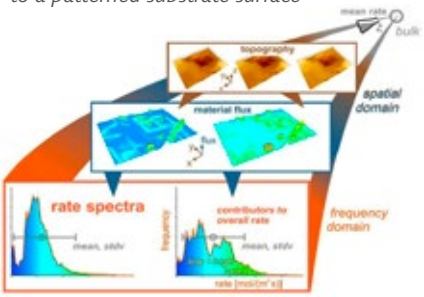
VSI-R: VERTICAL SCANNING INTERFEROMETRY - RAMAN COMBINATION

Surface reactions of materials result in heterogeneous alteration of their topography. Thus, repeated high precision measurements of reacting surfaces during experiments provide quantitative data about reaction kinetics and spatial heterogeneity of surface reactivity. Vertical scanning interferometry (VSI) is a surface-sensitive method that provides high spatial resolution and a large field of view. VSI is the method of choice to analyze the surface evolution of materials during corrosion or adsorption reactions. Now, with the novel combination of a Raman spectrometer (R) and VSI, we generate combined datasets of both the reaction kinetics and the chemical properties of reacting surfaces.

An exciting example is the unprecedented insight into the impact of microbial films on surface reactivity that the new VSI-R system provides. While VSI alone quantified already the alteration of surface topography, the new instrument provides spatially-resolved information about the surface chemistry and its changes.



left: Shewanella oneidensis bacteria attach to a patterned substrate surface



right: Mean reaction rates lack critical information about spatial distribution and intensity of contributors to the overall rate. In contrast, temporal sequences of topographic measurements map material flux directly via surface difference calculations. Analysis of these data in the frequency domain identifies critical modes of the resulting rate spectra

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Custom build prototype VSI-R combination

01 || General Information

Keywords: surface topography, surface chemistry, surface reaction kinetics, surface films, roughness

Categories:

- Surface/Interface Characterization
- Materials Properties
- Surface Analytics
- Spectroscopy
- Microscopy

Main Application: Analysis of chemical kinetics during dissolution/corrosion, growth, and adsorption of materials.

Measured quantities: surface heights, Raman shift spectra

Year of Fabrication: 2016

Manufacturer: Bruker, Renishaw

02 || Specifications:

- The Interferometer is equipped for white light scanning and monochromatic phase shift mode.
- Interferometer objectives include TTM, 5x Michelson, 20x, 50x, 115x Mirau, 0.55x and 2.0x FOV multiplier tubes.
- The Raman spectroscope is equipped with two lasers (532 nm and 785 nm).
- Maximum sample size is about 100 mm x 100 mm x 20 mm.
- Data reduction with SPIP software (Image Metrology).

03 || Contact:

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