VAMAS

Surface Chemical Analysis
Technical Work Area 2

Call for Participation

Project A42

Nano-scale roughness measurement with different AFM instruments

Objectives

The aim of the project is to find the most suitable measurement and image processing procedure with atomic force microscope for nanoscale roughness measurement. The interlaboratory comparison (ILC) will aim to test the distortion of the scanner and noise of the instruments for accurate roughness measurement for samples lower than 1nm in rms roughness.

Background

Atomic force microscopy (AFM) is often used to measure nanoscale roughness, however, there is currently no standard procedure. The project aims to find a standard procedure for industrial application with AFM.

Standardization Needs

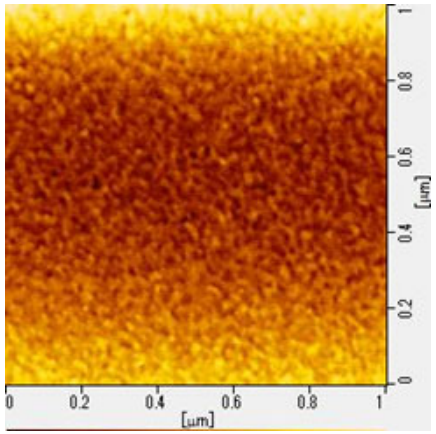
Roughness is one of the important value in the field of precision mechanical engineering. Additionally, nano-roughness for Si wafer is becoming more and more important, because of the extremely fine process of device technology.

AFM is often used to measure the roughness in nano-meter scale. However, the measured value is dependent on the image processing procedure, instrument noise and non-linearity. Standard calibration method and image processing procedure are important for AFM users.

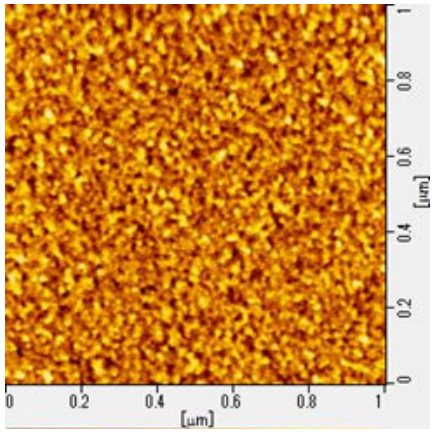
Work Programme

Participants will be asked to measure several samples with different surface morphology under atmospheric conditions and to report the roughness. Three kinds of samples and two cantilever with different probe radius will supplied to the participants.

(a) Residual roughness measurement. (Under zero scanning field of view.).



(b) Distortion of the image due to the thermal drift and distortion of the scanner.



(c) Example of processed AFM image from (b) for nano-roughness calculation.

Deliverables and Dissemination

Results will be used to compare the effects of noise, probe shape and image processing procedure using different AFM systems. These results will be used to write a draft documentary ISO standard for nano-roughness measurements for consideration under ISO TC201/SC9 (scanning probe microscopy).

For more information:

Project Leader
Dr. Hiroshi Itoh
National Institute of Advanced Industrial Science and Technology (AIST), Japan
h.itoh@aist.go.jp

TWA Chair (VAMAS TWA 2)
Prof. Ian Gilmore
National Physical Laboratory (NPL), UK
ian.gilmore@npl.co.uk

www.vamas.org

December 2024