



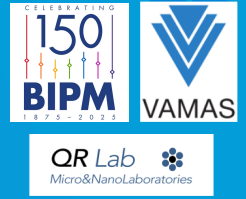
A VAMAS INTERLABORATORY COMPARISON FOR THE EVALUATION OF THERMAL PROPERTIES OF SILICON NANOWIRES BY SCANNING THERMAL MICROSCOPY

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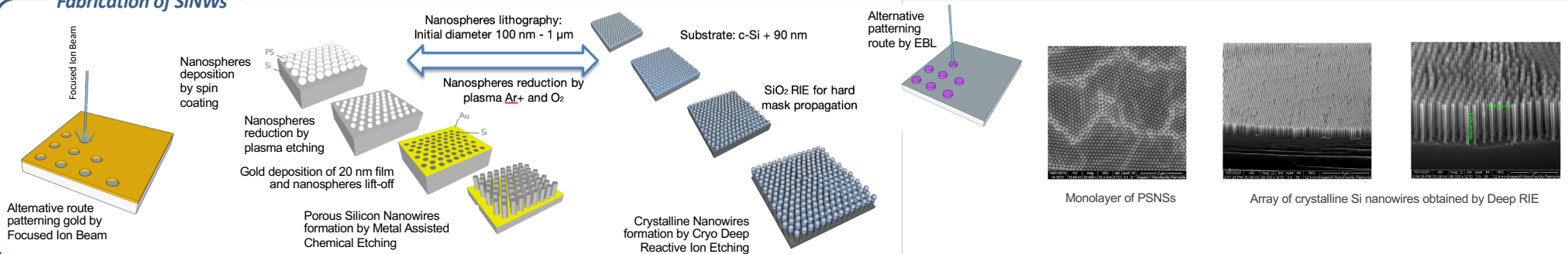
Introduction



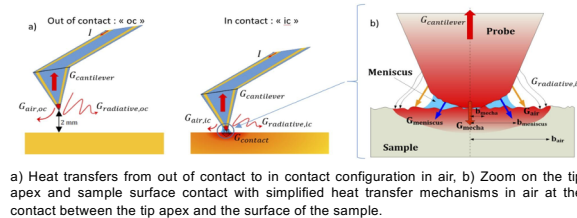
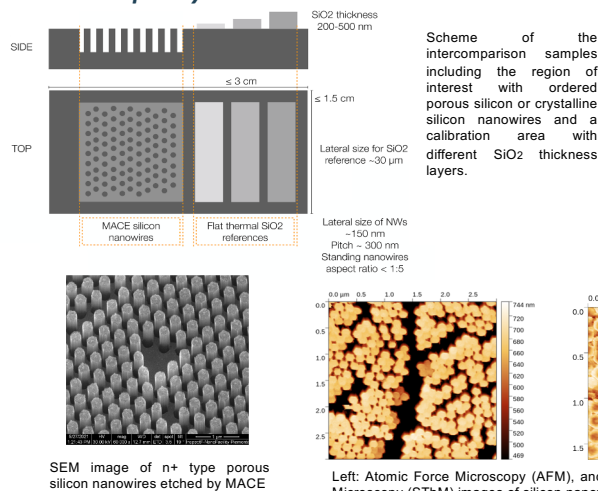
The Versailles Project on Advanced Materials and Standards (VAMAS) has been established by G7 in 1982 and supports world trade in products dependent on advanced materials technologies, through International collaborative projects aimed at providing the technical basis for harmonized measurements, testing, specifications, and standards. It is composed by more than 15 Technical Working Areas devoted to the standardization and measurements of advanced materials. The participants are selected on a volunteering base and must represent at least the three international areas, Europe, Americas and East (www.vamas.org). The aim of this international interlaboratory comparison is to determine quantitatively the thermal properties of arrays of silicon nanowires measuring periodicity, diameter and height, effusivity and thermal conductance using scanning electron microscopy (SEM), atomic force microscopy (AFM) and scanning thermal microscopy (SThM). The samples are fabricated by INRiM and will be circulated among the interested partners starting from November 2024 for the SThM measurements. Data will be evaluated by CMI and INRiM and included in the VAMAS final report of the project.



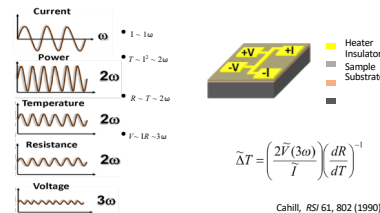
Fabrication of SiNWs



Sample layout

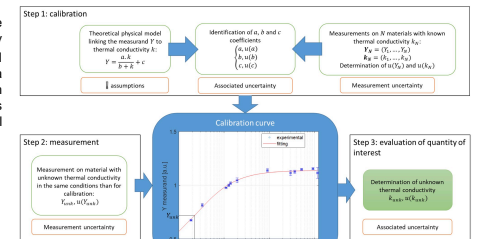


a) Heat transfers from out of contact to in contact configuration in air, b) Zoom on the tip apex and sample surface contact with simplified heat transfer mechanisms in air at the contact between the tip apex and the surface of the sample.



The SThM measurements will also be compared to results of thermal conductivity evaluation by the 3ω method on the original silicon dioxide substrates.

Methodology for traceable thermal conductivity measurement with SThM technique using a calibration curve built with a set of bulk materials with known thermal conductivity.



Main steps of an evaluation of measurement uncertainty according to the GUM or GUM-S1: Modelling the measurement, Evaluating input quantities, Propagating, Reporting and Setting an uncertainty budget.

