Partners

Project Details

PROJECT TITLE: Real-time nano-CHAracterization reLatEd techNloGiEeS

ACRONYM: CHALLENGES

STARTING DATE: 01 April 2020

DURATION: 36 months

TOPIC: DT-NMBP-08-2019 Real-time nano-characterisation technologies (RIA)

EU CONTRIBUTION: 4,691,566.25 euro

Contacts

Prof. Marco Rossi
SAPIENZA UNIVERSITY OF ROME

PROJECT COORDINATOR

marco.rossi@uniroma1.it

Isella Vicini
BEWARRANT

DISSEMINATION MANAGER

isella.vicini@bewarrant.be

Narciso Gambacorti
CEA

EXPLOITATION MANAGER

narciso.gambacorti@cea.fr

Powered by beWarrant S.L.

More Info:

www.challenges2020.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861857

CHALLENGES

Real time nano CHAracterization reLatEd techNoloGiEeS

The Project

The project CHALLENGES – Real-time nano-CHAracterization reLatEd techNoloGiEeS – aims to develop innovative Non-Destructive Techniques (NDTs) for reliable inline multiscale measurements down to the nanoscale, and fully compatible with different factory environments.

The developed metrology technologies will enable the increase of speed, resolution, sensitivity, spectral range and compatibility within different nano-related production environments, finally improving products performance, quality and reliability, with the consequent bosting of competitiveness.

The CHALLENGES's innovation will be developed exploiting the plasmonic enhancement of optical signals. It will provide a non-destructive approach based on the use of multipurpose nano-optical techniques to enable a reliable real-time nano-scale characterization in the factory floor, using plasmonic enhanced Raman, InfraRed (IR) and Photoluminescence signals.

Laboratory-based characterisation of nanomaterials has been, and continues to be, one of the key enablers in the growth of knowledge and experience on nanotechnology and nano-enabled products. CHALLENGES will extend the scope of nano characterization beyond off-site laboratory based measurements to proper nanometrology, and is expected to have impacts on industrial production of nano-enabled materials and devices starting from the applications targeted within the project, but with impacts potentially able to be propagated to all major nanomanufacturing processes.

Objectives

Specific objectives of CHALLENGES are:

• To provide a fully automated AFM-based tool

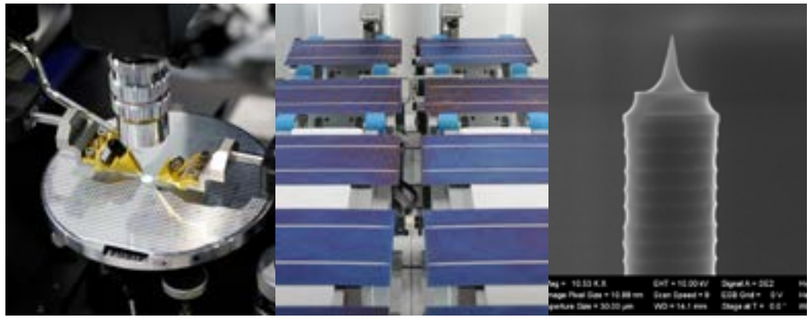
• To develop large sample XY piezo scanning stages

• To develop the optimum coupling solutions of light wavelengths range, AFM tip shapes and unconventional materials

• To design and demonstrate a nanoscale metrological NDT system that is compatible with production lines that need cleanroom environment

• To train a neural network capable to locate, with low-resolution hardware, relevant sites on the sample to probe with the high-resolution system, in a machine-learning framework

• To demonstrate the process-adapted nanoscale metrology for the manufacturing industry, through its use in three relevant industrial application contexts related to CMOS electronics, Silicon Photovoltaics and 2D Materials



Expected impacts

- Measurable improvement of speed by at least a factor 2 of nanoscale characterisation procedures, in comparison to already established performance and reliability for the application leading to a significant increase in industrial competitiveness.
- Significant reduction of the time and resources needed for nanomaterial development and upscaling, and for nanomaterials-based product development, which should be quantified with respect to established conditions for specific market sectors, with a return of investment in less than 5 years.
- Quantifiable enhancement of the ability to control the quality and reliability of products, with consequent improvement of product lifetime.
- Quantifiable enhancement of the ability to control the quality and reliability of products with associated environmental benefits.
- Creating a competitive edge in non-destructive technologies for materials characterization. Their implementation for in-line process inspection and control, will foster the competitiveness of EU Semiconductors, Photovoltaic and 2D Materials industries in global markets which are strongly dominated by the US and Asian industries.
- Giving to EU industry a competitive edge in the production of nanotechnology enabled products, enabling more cost-effective production and quality control processes.