Solids Mechanics Laboratory (LMS*), CNRS - Ecole Polytechnique UMR7649

THE PROBLEM ADDRESSED

How to couple and use a continuous laser in situ SEM in safety and characterize its impact on matter ?

Theoretical and experimental research conducted at the LMS allows us to optimize and understand the mechanical behavior of materials, and to affirm that microstructures control the behavior of materials. However, predicting the behavior of parts under conditions of use is a scientific and industrial challenge.

The approach which aims to predict the behavior of the material, via the control of its microstructure during manufactories, allows us to consider improving the service life of the materials.

How to modify matter surface by laser and characterize its evolution: morphology, chemistry and/or crystallography.

TECHNOLOGY

- We coupled a continuous wave laser to an environmental scanning electron microscope to have the possibility of treating samples of different nature. (conductive or not). The addition of gas in the chamber also allows to have an additional study parameter.
- LASEM is synchronized with an optical camera and a lighting system to visualize the area of the sample that will be treated by the laser.
- A non-contact temperature measurement system is provided to measure the local temperature of the laser treatment.

• Think versatile, LASEM is a device that allows to set:

LASEN

#MaterialBehavior #LASER #Microstructures

- i.power LASER source. 20W-200W
- ii.iSpeed (mm/s) and amplitude of scanning (mm)
- iii. Spot size of the laser (μ m).

This setting adjust the surface energy density on the sample.

COMPETITIVE ADVANTAGES

- Contactless surface modification, functionalization and observation in situ SEM.
- Contactless Microstructural surfaces modifications and chemical and crystallography characterization.
- Contactless High temperature heating in SEM.
- Adjustable spot size and speed scanning laser
- Optical viewing system allowing to see where LASER impact will take place
- Contactless temperature measurement measurement.
- No concurrence device on market.
- Projects AIDS, SATT, CNRS...

APPLICATIONS

- Wide industrial scope of applications : biology to metallurgy
- Laser surface optimization and their characterizations in situ ESEM
- Accessory Market of scanning electron microscopy

DEVELOPMENT STATUS

Functional laboratory prototype

- ESEM thermoelectric gun technology ThermoFisherScitentifc®
- Laser SPI® source with power, scanning and spot measured
- Lighting and Optical device system synchronized
- Safety operation.

INTELLECTUAL PROPERTY

- DI EP2022DI0010 / CNRS 26400-01
- Patent application FR2213567 du 16/12/2022
- Multi licensing

INVENTORS & CONTACTS

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PUBLICATIONS

 <u>https://www.scopus.com/authid/detail.uri?</u> <u>authorId=55839981800</u>

LOOKING FOR

- An application note with partner of community
- Funding to improve TRL get thermal et chemistry characterization
- Crystal CNRS.

DE PARIS