



Collaborations

INRA: Nantes

Unité MeDIAN: Médicament, Dynamique Intracellulaire, Architecture Nucléaire
CNRS UMR 6142 – Faculté de Pharmacie – Reims

IAS: Institut d'Astrophysique Spatiale, Université Paris 11



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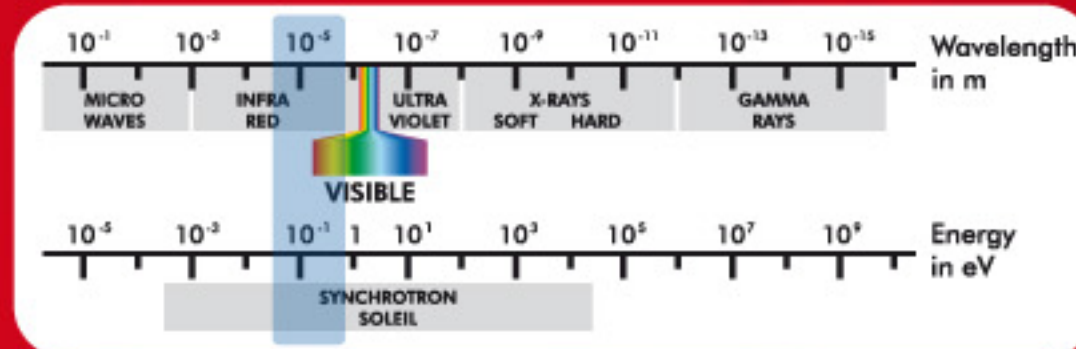


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Scientist



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Energy range of SMIS: 0.025 – 0.8 eV (i.e. 50 to 1.5 μm wavelength)



Light source: bending magnet

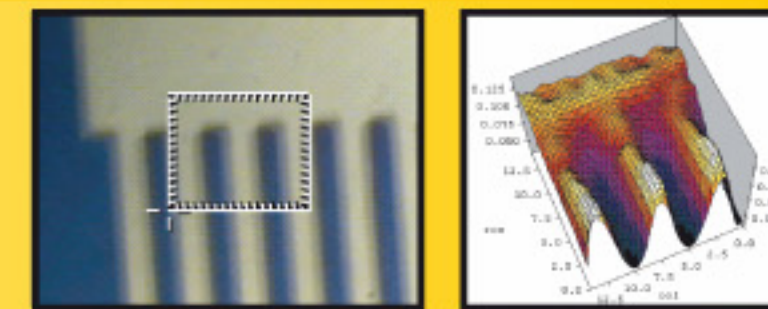
Experimental techniques:

- Infrared spectroscopy
- Infrared microscopy
- Coupling with fluorescence spectroscopy

Topics and applications

→ Soft matter studies: analysis of inclusions in polymers, variation of their chemical composition with temperature; polymer deformation under stress.

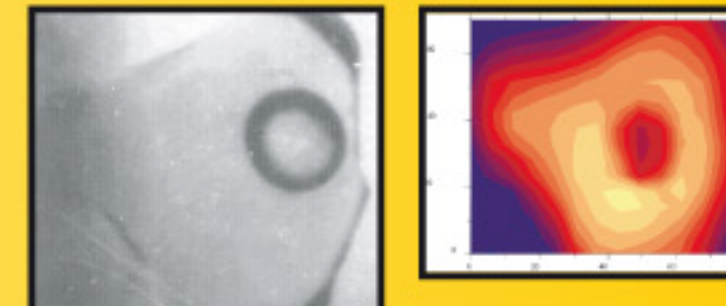
Applications in material science



Deposition process of a polymer film on a silicon wafer.

→ Determination of the chemical nature and imaging of inclusions in minerals.

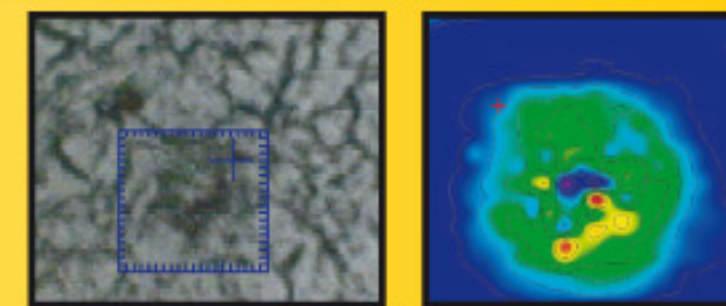
Applications in geology



Aliphatic compound in a calcite inclusion.

→ Studies of individual cells, biological compound distribution imaging in a cell, studies of human tissues (hair, skin, bone), bacteria identification, studies of tumour cells.

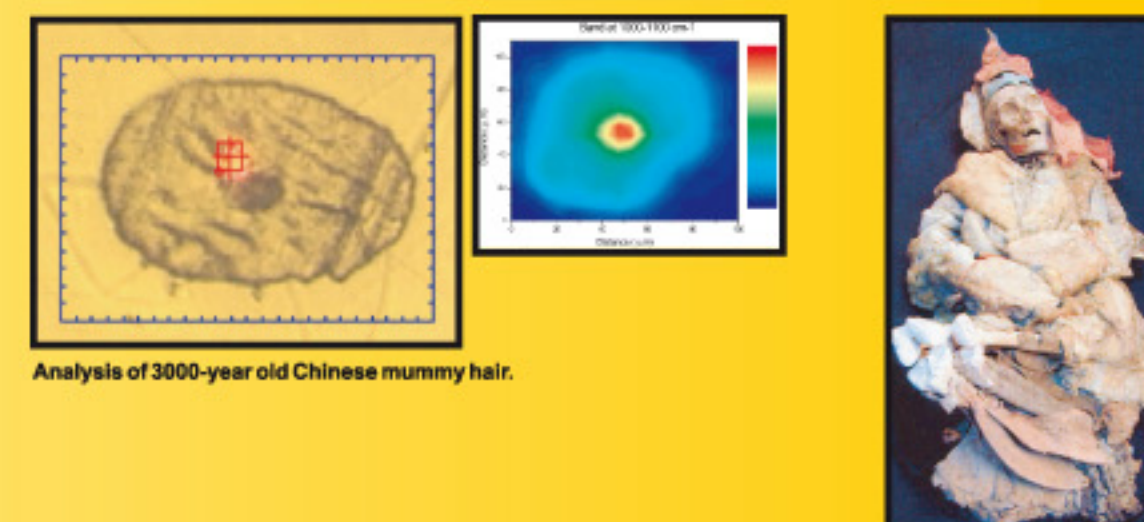
Applications in biology and the biomedical field



Brain analysis on a patient with Alzheimer's disease. Senile plaques made of beta-amyloid accumulation are revealed around neurons.

→ Rare and fragile sample analysis: mummy tissues, paint particles, Ancients cosmetics and objects.

Applications in archaeology and Heritage

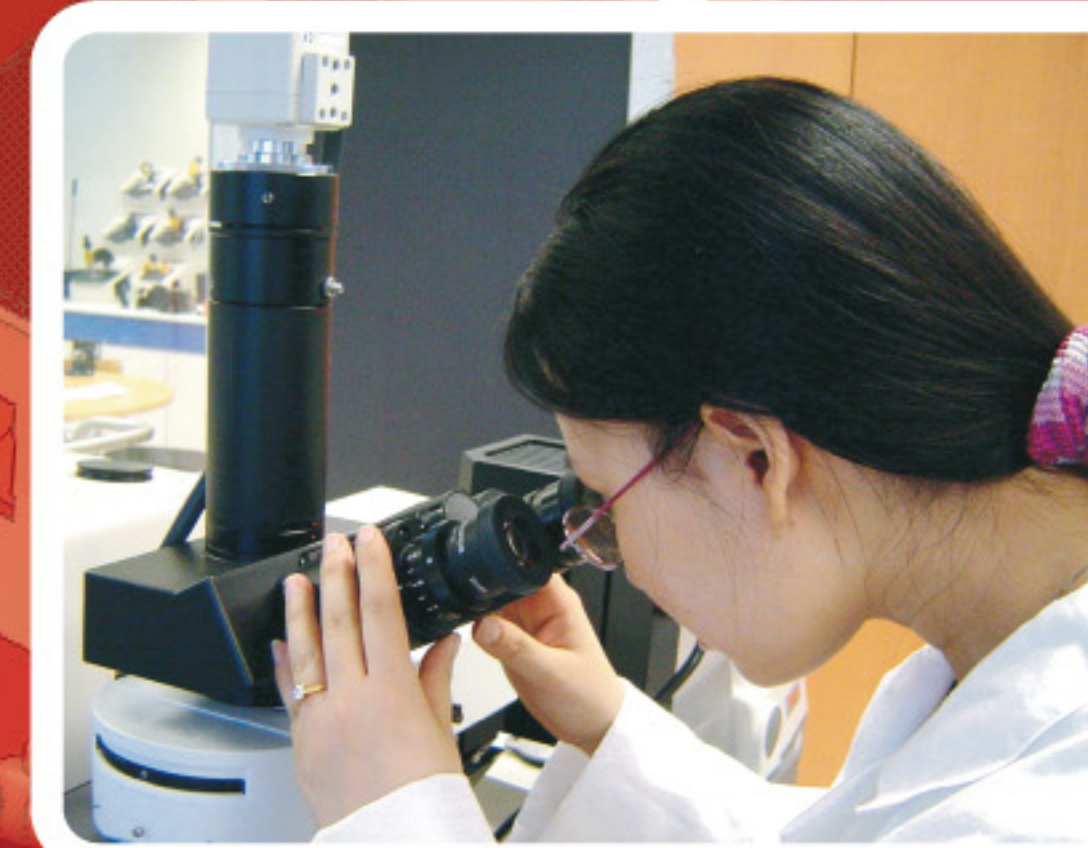


Analysis of 3000-year old Chinese mummy hair.

SMIS, Spectroscopy and Microscopy in Infrared using Synchrotron

For microscopic studies of a variety of compounds in various conditions of temperature, pressure or mechanical stress.

Zoom: Infrared microscopes



The SIMS beamline will be equipped with two infrared microscopes that are instruments similar to optical microscopes and are coupled to an infrared spectrometer. With this combination, objects to be analysed can be observed on the scale of a few microns while measurements are simultaneously performed to determine their nature or their chemical composition by infrared spectroscopy using synchrotron radiation.

Beyond serving for visualisation of objects and their identification by infrared spectroscopy,

these microscopes will be equipped with a mercury lamp to carry out simultaneous observations of fluorescent products.

Infrared microscopy using synchrotron radiation has many applications in several scientific fields:

- **Biology:** the biochemical composition inside a single cell can be determined, which helps understand composition abnormalities, for instance in tumours.
- In archaeology, one can identify tiny paint fragments on old paintings; understand hair or mummy skin ageing mechanisms...
- In geology, with this type of analytical technique, one can identify the nature of compounds trapped in inclusions and in particular those coming from deep inside the Earth's crust (from volcano eruptions).
- In polymer science, this technique is used to understand properties of thin films or polymer wires under tension or as a function of other parameters such as temperature, for instance.