



SOLEIL is a very high-technology research infrastructure which produces and operates a light of extreme brilliancy, ranging from THz to hard X-rays, which is used to study living matter and complex materials. Open since 2008 and equipped with 29 specialized laboratories called beamlines, SOLEIL is a scientific research center performing its own research (250 SOLEIL publications in 2012) and a center for services to research and industry (157 external user publications and 45 industrial projects in 2012). 25% of SOLEIL activities are implemented in life sciences.

SOLEIL, an asset to your R&D and innovative activities in cosmetics

Advanced solutions for cosmetics:

- **Monitoring the penetration of your molecule of interest without marking**
- **Monitoring modification of tissue constituents (collagen, elastin, protein, phospholipid...) by your molecule**
- **Preparation of your products : Characterization of emulsion, powder, gels**

Techniques

Microspectrofluorimetry in UV/Deep UV

- Spatial resolution < 100 nm.
- Several molecules, naturally present in cells and tissues, do fluoresce after Deep-UV excitation (aromatic amino acids, collagen, ferullic acids, lignin...).

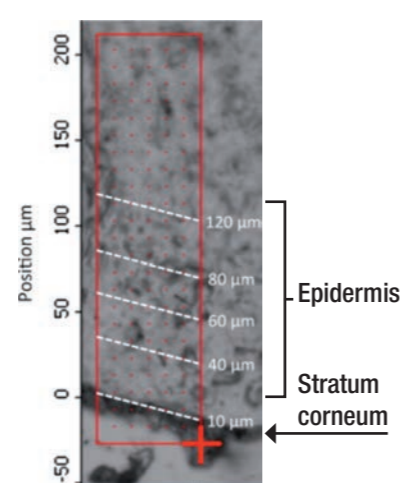
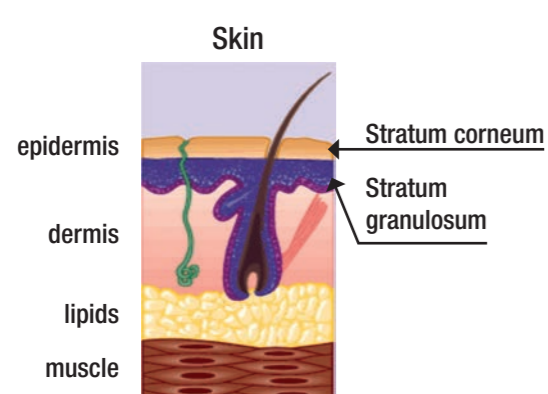
Microspectroscopy FTIR

- Spatial resolution < 3x3 μm²
- Allows chemical imaging cells or tissues.
- Allows the characterization of secondary structure.

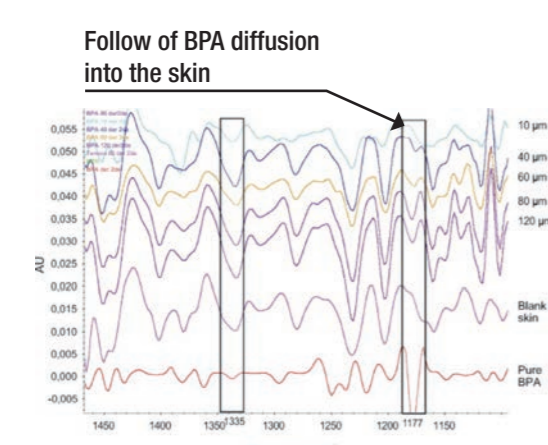
Advantages of synchrotron light

- Imaging with spatial resolutions ranging from tissue to subcellular scale.
- Non-destructive analysis ; combinations of complementary techniques.
- Unmarked cell effectors observation: measurement of intrinsic signal components.
- Sensitivity and high «signal to noise».
- Speed of the data acquisition for the repeatability.
- Fluorescence in the far UV, only accessible with synchrotron radiation.

Study of human skin and penetration of external agents by FTIR



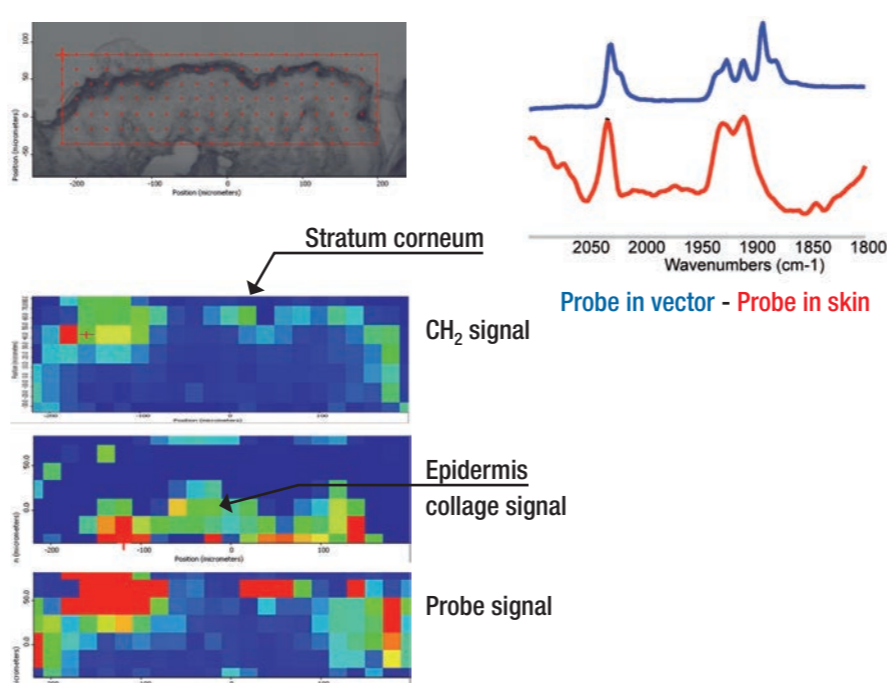
Picture of skin sample on CaF₂ window during SR-FTIR acquisition. Molecule distribution was studied at 10, 40, 60, 80 and 120 μm by taking into account skin orientation on the window.



Average second derivative spectra of skin treated with benzophenone (BPA), at 10, 40, 60, 80 and 120 μm, spectrum of blank BPA-free skin and spectrum of pure BPA molecule. A reference band was selected at 1335 cm⁻¹, this band was detected in all skins treated with the molecule or blank and served as a reference to correct for skin thickness. A specific band was selected at 1177 cm⁻¹ to follow BPA diffusion into the skin. This specific band was found in pure BPA spectrum but was absent in blank skins.

Development of a percutaneous penetration predictive model by SR-FTIR. Jungman E, Laugel C, Rutledge DN, Dumas P, Baillet-Guffroy A. Int J Pharm. 2013

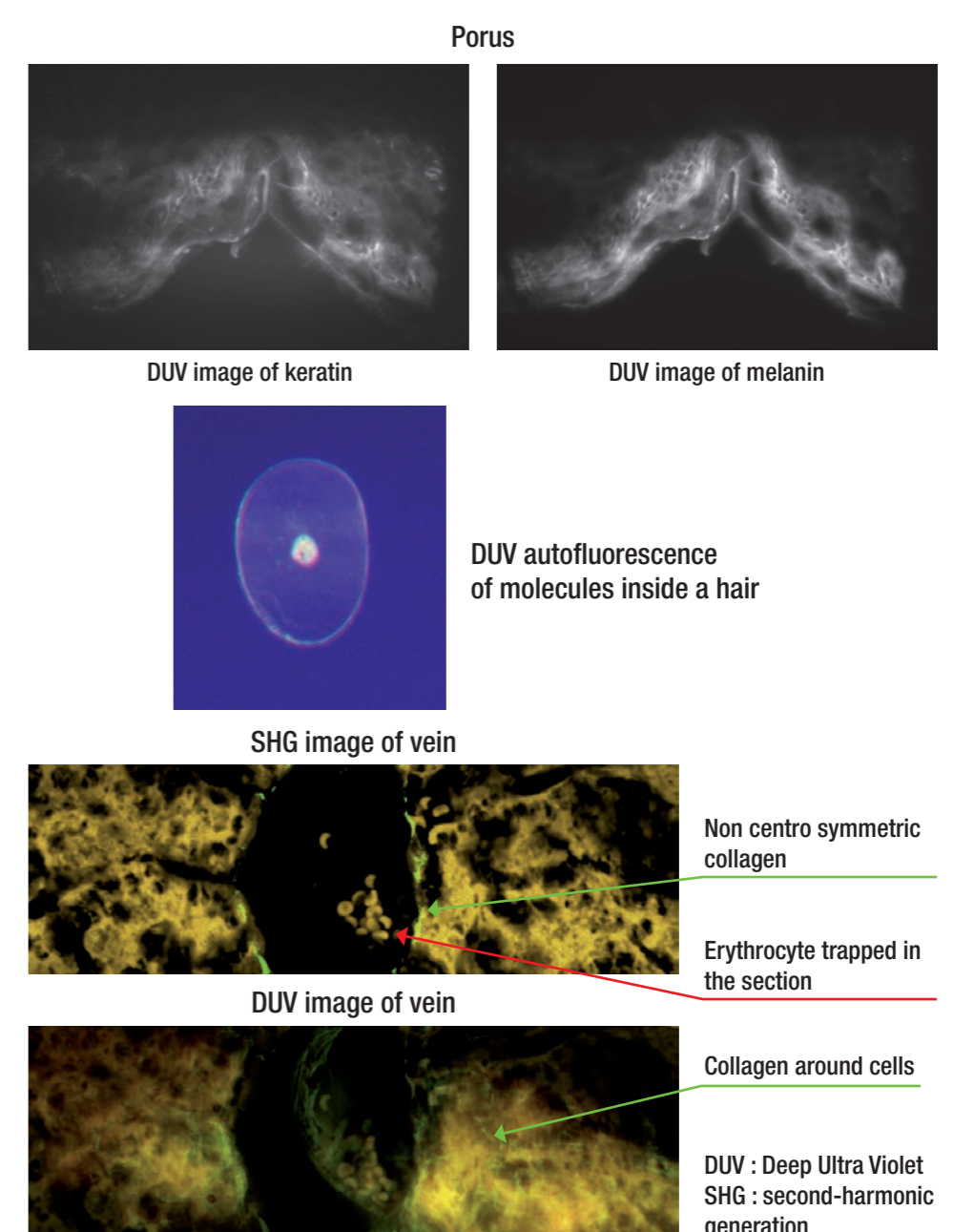
Monitoring the penetration of infrared active probe tagged vectors carrying molecules with pharmaceutical and cosmetic interest by infrared microspectroscopy



Bicellar systems are phospholipid discoidal assemblies formed in water useful for vectoring dermatological and pharmaceutical molecules through the skin barrier. Localization of these systems in the skin is necessary in order to determine where molecules will exert their function and to improve their applicability for skin protection. In order to follow bicelles through the skin, a new rhenium tris-carbonyl derivative tagged-lipid IR probe LRe(CO)₃ is incorporated in the nanostructures.

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Images of autofluorescent molecules by DUV



Matthieu Refregiers, SHG and microspectrofluorimetry, Synchrotron SOLEIL

Access modes : scientific projects leading to publications; partnerships for long term projects ; proprietary research ; new dedicated R&D platform (PFMI COSMETOMIQUE)...



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