ICFO Colloquium PAUL DUMAS 'Infrared Synchrotrons and Lasers for Biomedical-Related Applications'

PAUL DUMAS

April 10, 2015

Friday, April 10th, 12:00, ICFO's Auditorium

PAUL DUMAS

Director of Research CNRS (Centre National Recherche Scientifique). Synchrotron facility SOLEIL, Gif Sur Yvette (France) $$Paul Dumas is a Director of Research, at the CNRS (Centre National Recherche Scientifique) in France, presently working at the French synchrotron facility SOLEIL. Being a physicist, he has developed and expanded the exploitation of the synchrotron radiation light in the infrared region. He has led the design and construction of several synchrotron infrared beamlines around the world. He was the beamline manager of the SMIS beamline (Spectroscopy and Microscopy in the Infrared using Synchrotron) until recently. He has been involved in a large variety of research programs, to exploit this infrared bright source: physic at surfaces, high pressure research, archaeology and cultural heritage , biology and biomedical being the main applications. He is member of several Scientific

Advisory Committees and Program Review Committees of Synchrotron facilities around the world.
The synchrotron infrared light has significantly contributed to the recognition of the analytical potential in many scientific disciplines , in particular in Biology. Coupled to an infrared microscope, the brightness properties of such a source, has pushed the analysis down to a probe area only limited by the diffraction limit. In short, sub-cellular analysis , and chemical imaging are the most demanded features for the biology and biomedical communities requesting an access to the dedicated beamlines at synchrotron facilities worldwide.

The high intensity and spatial resolution, are associated nowadays with extremely stable photon beam produced by the synchrotron source. In biology, these three advantages make the recording of vibrational signatures of cells and tissues ,fast and of very high spectral quality .

Biomedical applications appeared rapidly as one of the attractive new advantage for using such a technique. As example carried out at the infrared beamline at SOLEIL, stem cells have a clear vibrational signatures of their origin, and induced pluripotent stem cells have epigenetic memories recognized by their vibrational signatures, leukemia individuals cells displays a early secondary structure change when becoming resistant to their treatment.

With the increasing demand in diagnostic, synchrotron facilities do not provide rapid access as often as needed, and they are far for Hospital or dedicated laboratories. Synchrotron studies are then the test bed for applications with infrared lasers, as long as they satisfy to two parameters: fast tunability, even in a limited spectral range (which is identified with the synchrotron broad band source), and high stability, since the diagnostic relies upon small biochemical changes which are detectable only on high quality spectra.

Progresses are underway for lasers, and they are considered as the key development for efficient diagnostic tools using vibrational fingerprint of the biological samples.

Friday, April 10th, 12:00, ICFO's Auditorium