



The SOLEIL: Facilities and opportunities for Nanoscience and Nanotechnology research

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SOLEIL is a major French scientific facility which makes it possible to explore the microscopic structure of materials and living matter together with a precise determination of their physical, chemical, mechanical and/or biological properties. The parameters of this multidisciplinary machine have been defined in order to carry out a very wide range of studies in the fields of fundamental research as well as applied and industrial investigations. The main shareholders (CNRS and CEA) of this non-trading company and its partners have opened the installations of the Synchrotron SOLEIL to medium- and small-scale industries in addition to actors involved in some of the major scientific communities at regional, national, European and international level.

SOLEIL is being dedicated, for the greater part, to academic and applied research, development, quality control (raw advanced materials, intermediary products, finished products, and processes) in conjunction with manufacturing activities in a great variety of domains: (1) pharmaceutical, biotechnological, and medical industries; (2) chemistry, petrochemistry, cosmetics, agro-food; (3) metallurgical industry, mechanics, electronics; (4) plastic, ceramic, glass, nano structures etc.; (5) environment, geophysics, earth sciences; (6) national defence and security, scientific heritage etc.; (7) sustainable development, cultural heritage etc. The twenty four selected beamlines have been designed in order to cover most refined analysis needs for characterization a broad range of systems. In most of the cases, a complete study is required by measuring simultaneously or in parallel processes of absorption, diffraction, scattering, fluorescence, microscopy, spectro-microscopy, tomography, imaging etc. In some beamlines of SOLEIL, it is possible also the implementation of processes involved in the transformation of matter, as production of micro-systems, irradiation of biological materials or mechanical processing.

In this context, and taking into account that synchrotron-radiation based techniques are nowadays highly sophisticated, the field is prepared to target the micro- and nano- focusing of X-Ray with application in nanoscience. Considering that "nano" is a key word for present and future technologies, this domain is particularly prioritized in SOLEIL as in many other synchrotron sources. As it is has

been already well established, these systems do exhibit interesting properties that are waiting to be disclosed. Techniques like x-ray imaging and x-ray spectro-imaging or diffraction are just starting to tackle this new exciting field. If up to now standard absorption, photoemission and diffraction techniques are mostly dealing with large ensembles and averaged (statistical) properties, it is of high interest to measure the structural properties of individual sub-micro and nano sized objects in order to understand the change in their physicochemical properties, when the nanoscale is in place. Thus micro-probes based on the interaction of X-ray with matter, are expected to bring light on the local electronic and structural properties of such single objects in the world of nanoscience. To this aim, certainly SOLEIL has made a considerable effort dedicating a considerable portion of its budget to built a set of edge beamlines which are addressing the challenging problem of focusing a high density of photons up to micro or nano spot size to study with very high spatial resolution the spectroscopic and geometrical properties of a wide range of systems. The main highlights and a brief description of the most representative beamlines will be presented.