L-01 **Sun. 15. 06., 18^{00}-18^{40}**

Addressing properties of morphology complex materails and individual nanostructures using synchrotron-based spectromicroscopy and imaging

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Exploiting the structure and composition of technologically relevant complex materials at their natural length scales and working environment is important prerequisite for understanding dimensionality dependent phenomena. In this respect processes occurring at surfaces and interfaces control the properties of many materials where issues of complexity at microscopic length scales should be faced and understood. The complementary capabilities of synchrotron-based photoelectron microscopes in terms of imaging, spectroscopy, spatial and time resolution have opened unique opportunities to explore the surface composition of micro- and nano-structured materials as a function of their size, morphology and exposure to different ambient and temperature [1]. The most recent achievements in this respect will be illustrated by selected results with special emphasize on studies of to individual supported and free-standing nanostructures [2-5] and electrochemical devices [6].

[1] A. Barinov *et al*., *Nucl. Instr. Meth. Phys. Res.* **A 601** (2009) 195–202.
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[3] V. Sysoev *et al.*, *ACS Nano* **4** (2010) 4487.
[4] A. Barinov *et al.*, *Adv. Mater*. **21** (2009) 1916.
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L-02 **Mon. 16. 06., 9^{00}-9^{40}**

New generation of light sources: present and future

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More than 50 years after the lasers discovery and more than 30 years after the first Free Electron Laser (FEL), VUV-X light sources are actively developed around the word. Besides X-ray laser and High order Harmonic Generation in Gas (HHG) or on solid targets, synchrotron radiation from third and fourth generation light sources rely on synchrotron radiation generated from charged particles in bending magnets or undulators, creating a periodic permanent magnetic field. In FELs, the longitudinal coherence is achieved by setting in phase the electrons, thanks to an energy exchange between the electrons and a light wave resulting in bunching and gain for light wave amplification. FELs offer femtosecond intense tuneable light. Presently, several facilities are open for users in the world : LCLS and SACLA in the 1-0.1 nm spectral range, and in the VUV soft X-ray region FLASH and FERMI, first seeded FEL open for users.

In the quest to the fifth generation of acceleration based light sources, paths towards advanced and compact FELs are open. In order to approach diffraction and Fourier limits in a wide spectral range and with versatile properties, one considers FEL oscillator in the X-ray range, advanced seeding, multiple simultaneous operation, high repetition rate. In order to search for compactness, one considers investigating further the seeding schemes for the FEL line and replacing the conventional linear accelerator by a compact alternative one, such as dielectric accelerator, inverse FEL and Laser WakeField Accelerator (LWFA). Indeed, the rapidly developing LWFA are already able to generate synchrotron radiation. With an electron divergence of typically 1 mrad and an energy spread of the order of 1 %, an adequate beam manipulation through the transport to the undulator is needed for FEL amplification.

Several directions are explored within the LUNEX5 (free electron Laser Using a New accelerator for the Exploitation of X-ray radiation of 5th generation) project, aiming at investigating the production of short, intense, and coherent pulses in the soft X-ray region with 400 MeV electron beam (both from a superconducting linear accelerator for high repetition rate multiple user operation and a LWFA, a single FEL line with HHG and Echo Enable Harmonic Generation seeding). A test experiment for the demonstration of FEL amplification with a LWFA is under preparation in the frame of the COXINEL ERC contract.

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