516

17

IR and X-ray combinatorial experiments and imaging. an original approach to characterize materials and dynamical phenomena

Augusto Marcelli (INFN, Italy)

2017 12 4 16:30-

C212

FTIR synchrotron radiation (SR) micro-spectroscopy is a powerful molecular probe at relatively high temporal (~msec) and spatial resolution (~ m) that probes rotations and vibrations of molecules, low-energy excitations of solids and many other phenomena occurring in condensed matter physics, chemistry, biophysics and materials science. The incredible performances of non-thermal synchrotron radiation (SR) sources are witnessed by the results obtained in different research areas and the continuously increasing number of users in the existing facilities all around the world. Since in the IR region the brilliance of a SR source is between two and three orders of magnitude higher than conventional sources, we observed in the last three decades a continuous increase of IR beamlines and users. Moreover, after the first attempt in 1995 at Daresbury, where a simultaneous IR and x-ray small angle scattering analysis was performed, other concurrent SR radiation experiments have been later performed. They probed systems at different wavelengths using X-ray techniques and optical methods in UV/Vis and IR domains, providing unique complementary information. Years later, a real concurrent approach has been used at Elettra (Trieste) to investigate non-equilibrium processes in mesostructured systems.
I will show representative experiments that show the great advantage of the IR SR sources and unique applications such as imaging and time-resolved spectroscopy. Indeed combining IRSR properties with Focal Plane Array (FPA) detectors the possibility to investigate many processes in real time is now feasible. Moreover, taking advantage of a high circulating current and a dedicated detector set up it is now possible to collect IR images of individual cells at high sensitivity and high spatial resolution within a few minutes. Still, many new opportunities are around the corner. The first IR-laser source enabled IR microscope covering the 7-12 μm spectral range was released in early 2014 using a series of quantum cascade laser (QCL) sources and the operation of the first mid-IR supercontinuum spanning from ~1 m to more then 13 m has been experimentally demonstrated. After more then a century, the mid-infrared molecular 'fingerprint region', which is of key importance for many researches and applications still represent an area of great research opportunities.

5

7386

7653 6552
7021 7471
7741
5720