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# In-situ time-resolved x-ray and IR combinatorial approach for materials science investigation using 3rd generation synchrotron radiation sources

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Third generation synchrotron radiation (SR) facilities are designed to host powerful brilliant radiation sources like undulators and wigglers. The next frontier of SR experiments is represented by the combination in a concurrent set up of different wavelengths, to characterize complex systems where different processes due to the interplay between localized and delocalized electrons, charge transfers, collective excitations and molecular vibrations may occur.
After the first attempt, a simultaneous IR and x-ray analysis made at Daresbury in 1995, many SR radiation experiments have been performed probing systems at different wavelengths using X-ray techniques and optical methods in UV/Vis and IR domains, providing scientists with unique complementary information. As an example the concurrent approach has been used at Elettra to the study of non-equilibrium processes in mesostructured systems. A proposal for a IR and X-ray simultaneous spectroscopy beamline has been submitted in 2007 at Diamond and, later, similar projects have been proposed elsewhere. The optical design for a conceptually new beamline allowing time-resolved concurrent X-ray and IR experiments, has been published and advantages, challenges, and opportunities to combine SR-based X-ray techniques with vibrational spectroscopies have been discussed. Here, we will present the science case and the status of the project for a time-resolved beamline combining IR and X-ray radiation.

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