Inelastic X-ray scattering: present status and future perspectives of the technique

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Inelastic X-ray scattering (IXS) gives information on a rich spectrum of excitations comprising phonons in the meV energy range and core electrons excitations in the ~100 eV energy range up to Compton scattering in the keV energy range. Different setups optimized for the different energy ranges have been developed at third generation synchrotron sources in the last ~20 years and more, and are attracting a still increasing user demand. In this presentation I will introduce the most important experimental schemes which are nowadays used to measure IXS, emphasizing the classes of experiments where they have been found to give the most interesting results. This includes the study of vibrational excitations in crystals and glasses which is carried out at very high resolution beamlines; and the study of core-electron excitations - in particular experiments at high-pressure conditions – that are carried out at lower resolution beamlines. Finally, I will discuss the future perspectives of these techniques both at new beamlines at third generation synchrotron sources and at free electron laser sources.