

X-ray scattering techniques and *in situ* time resolved experiments: new tools for the characterization of crystalline phases using synchrotron radiation.

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Many new materials obtained through artificial methods of synthesis and growth have a rich variety of physical properties, all of which can be ascribed to their structure in different length scales. The small and wide angle X-ray scattering techniques (SAXS/WAXS) provide important structural information on these materials at the atomic and supramolecular level. SAXS data reveals statistically significant information about structures in the 1 to 100 nanometer scale. In the study of systems in which isolated nano-particles are imbedded in weakly-interacting matrices or in the case of nano-crystalline solids in which fine grained particles are separated by high-angle grain boundaries or solid-solid interfaces the effect of the nanometer scale structure is reflected in the behavior of the scattering intensity. The scattering curves can provide information on grain size distribution and the geometry of grain boundaries. WAXS data reveals details of crystalline phases at the atomic level, including the contribution of high defect density and lattice strain. In specific cases, simultaneous scanning calorimetry (DSC) can complement the experiments. Molecular self assembly and micro-crystallization in liquid and solid environments can be studied in real-time using synchrotron radiation. The potential application of combined SAXS/WAXS/DSC experiments is also possible in the follow-up of phase transitions in several crystalline compounds. Recent results of technological and scientific interest obtained in the identification of different materials will be presented in this communication.