Synchrotron Infrared Microspectroscopy: A powerful tool for polymer science.

Gary Ellis

CSIC, Institute of Polymer Science & Technology, Madrid, Spain
gary@ictp.csic.es

Due to their unique structure-property advantages, since their discovery in the early part of the 20th century polymers have been used to substitute both naturally occurring and processed materials (eg. wood, metals, ceramics, etc.), to such an extent that they are now an essential ingredient of modern society. Polymers can be found in almost every area of technological interest, from basic household items through medicine and biotechnology, to aerospace, alternative energies and the digital world. Consequently the development of new polymeric systems continues to be one of the most active areas in scientific research.

Perhaps one of the most important, and certainly the most widely used, techniques to characterize polymer materials is vibrational spectroscopy, providing a rich source of information on important aspects such as composition, conformation and orientation of the polymer chains. Whilst the combination of vibrational spectroscopy is well established, over the last decade the advances in synchrotron IR microspectroscopy, SIRMS, have opened new opportunities for the characterization of polymeric materials. The high brightness synchrotron IR source can be very effectively focused to a small spot size at the microscope stage, providing diffraction-limited far-field microspectroscopy over the whole infrared range. For the polymer scientist that means higher spatial contrast with high signal-to-noise ratios, giving access to more detailed characterization of heterogeneous polymeric materials.

In the talk details illustrating the versatility of SIRMS for the study of polymeric materials will be presented in areas such as polymer composites and alloys, multilayered polymers, biodegradable polymers, and oriented semicrystalline polymers.