Spectroscopy with Synchrotron Radiation: New and Not-So-New*

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Two trends affecting the synchrotron spectroscopy community are the rapid emergence of infrared experiments at several facilities and the increasing availability of polarized x-ray sources where the polarization can be switched at a reasonable rate, typically greater than 10 Hz. Periodic modulation of the polarization of an x-ray beam should greatly increase the sensitivity of experiments such as circular dichroism and magnetic circular dichroism that measure the difference in absorption of two opposite polarizations. The spectral extensions provided by high-brightness infrared beams from synchrotrons are particularly dramatic as the spectral region of greatest interest is four decades broad, *i.e.*, wavelengths from 1 micron to 1 cm. However, neither polarization modulation or infrared applications of synchrotron radiation are really "new" methods. Rather, both are emerging from a period of 10 to 25 years of research and exploratory development and entering a period of rapid deployment. On the other end of the electromagnetic spectrum, the ability of accelerator-based light sources to generate well-collimated, nearly monochromatic beams of gamma rays is an exciting new opportunity, albeit several years from widespread deployment.

The evaluation of light sources is frequently discussed in terms of brightness or brilliance, which have the attraction of combining a number of important parameters into a single figure-of-merit, hence facilitating comparisons. Over reliance on such metrics may, however, not provide the most appropriate means of evaluation in some situations.

The great success being enjoyed by synchrotron sources in certain areas of biomedical research is promoting the welcome influx of new users and the resources to support them. These developments also pose new challenges in quality assurance that the synchrotron community should address proactively.

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