Circular Dichroism Spectroscopy

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Technology description

Circular dichroism (CD) is the differential absorption between left and right circularly polarised light on passage through a sample. Measurement of CD gives structural and enantiomeric information on proteins, other biomolecules and liquid crystals. STFC’ s new circular dichroism detection system overcomes the sensitivity and speed issues faced by conventional CD detection system.

DESCRIPTION

Circular dichroism is a secondary component of the measurement of absorbance which makes it a difficult property to measure. Typically the absorbance due to circular dichroism is around one part in 105 of the mean intensity of light transmitted by a sample. Measurement is further complicated by the fact that absorbance measurements are often performed at ultraviolet and deep ultraviolet Wavelengths (i.e. <200 nm).

It is conventional to detect circular dichroism by modulating the polarisation of light incident on a sample using a polarising modulator, and then detecting the modulation of light transmitted by the sample using phase-locked detection. The polarising modulator is for example configured to switch the polarisation of the incident light beam between left hand polarisation and right hand polarisation at a frequency of 50 kHz, and the phase-locked detector measures at 50 kHz light incident upon the detector. Also, single element detection systems such as photomultiplier tubes are used to detect CD. The CD detection processes takes many minutes when the circular dichroism signal is strong, but many hours when the circular dichroism signal is weaker

STFC’ s new CD detection system will allow faster detection with improved sensitivity, by expanding the beam of modulated light after passing through the sample and then directing the expanded beam to a 2D array of solid state detectors. The detector array is arranged to receive different parts of the expanded beam. This allows the system to capture more information than conventional systems. A processing algorithm first digitises detected signals before synchronising with the modulation applied. This leads to faster and more sensitive measurement.

INNOVATIONS

- A two dimensional array of solid state detectors instead of a single photomultiplier tube.
- Digitisation prior to synchronisation of detected signals.

Application area

- Spectroscopy applications in biology and biochemistry

Advantages

• Increased information gathering
• Faster than conventional systems
• Improved sensitivity

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