Optical Rotatory Dispersion and Circular Dichroism

Plane-polarized light can be resolved into two circularly polarized beams that trace out helical paths of opposite chiralities, thus one beam is polarized in the left handed direction and the other in the right handed direction.

When plane-polarized light passes through a dyssymmetric solution the left handed and the right handed circularly polarized beams have different indices of refraction and different molar extinction coefficients. The former fact is responsible for the phenomenon of circular birefringence and the dependence of the circular birefringence on wavelength of the light is termed optical rotatory dispersion (ORD). The development of different molar extinction coefficients is responsible for circular dichroism (C.D.)

Optical rotatory dispersion spectra are recorded through measurement of the optical rotation $[\alpha]$, as a function of wavelength, For certain compounds the most useful quantity is the reduced mean residue rotation, $[m']$.

C.D. spectra are recorded as the ellipticity of the transmitted light; the useful quantity being the mean residue ellipticity (θ). Both ORD and CD spectra are related to asymmetric or dissymmetric electronic transitions and contain basically the same information. Both types of measurement are widely employed for establishing molecular structures.