

Synchrotron Circular Dichroism spectroscopy: a brief review of its potential for investigations of interactions in archaeological wood systems

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Synchrotron circular dichroism (SCD) is widely used to study chiral molecules, in particular proteins in solution and in thin amorphous dry films [1,2]. In the near-UV region (250 – 340 nm) it reports on tertiary structural conformational changes in proteins revealed through changes in the environments of aromatic amino acid residues, whilst measurements in the far-UV region (180-260 nm) reveal protein folding and secondary structure composition e.g. [2,3]. A unique strength of SCD spectroscopy is its higher photon flux and extended vacuum UV region down to 125nm², the latter being particularly useful for obtaining spectral measurements of sugars, oligosaccharides and complex polysaccharides including cellulose [4,5]. The technique is of high sensitivity and excellent for measurements of conformational changes induced upon addition of ligands and changes in solvent conditions. However, thus far it has not been extensively used to investigate celluloses, hemicelluloses, lignin and other related complex systems, perhaps because of the claimed lack of optical activity of the lignins [6] and the more specialised requirements of vacuum UV conditions. However, interactions of celluloses, hemicelluloses and lignin with chiral ligands have been more recently studied [7]. With the development of next-generation consolidants including molecules that interact with specific remnant molecular structures in archaeological wood [8,9], here we indicate the potential of using SCD to investigate polymerisation and networking interactions involving consolidants of the future in aqueous and non-aqueous systems.

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