

Irradiation Studies on Protein Integrity in High Flux Synchrotron Radiation Circular Dichroism (SRCD) Spectrometers show that Denaturation Caused by Local Heating Rather than Degradation is the Primary Effect

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Synchrotron radiation circular dichroism (SRCD) spectroscopy is emerging as an important new tool in structural biology (1). The effects of very intense synchrotron radiation vacuum ultraviolet (VUV) light on the circular dichroism spectra and chemical integrity of proteins studied by this technique have been examined. Originally we had shown that in lower flux SRCD instruments, VUV radiation damage to proteins was not evident after exposure over a period of hours (2). No effects were detected in either the protein primary or the secondary structures. However, with the development of high flux beamlines, this issue was revisited because of changes observed in the SRCD spectra of consecutive scans of protein samples obtained on such high flux beamlines. A series of experiments were designed to distinguish between two different possible mechanisms (3): photoionisation causing either free radicals or secondary electrons producing degradation of the protein, or local heating of the sample resulting in protein denaturation. The latter appears to be the principal source of the observed spectral changes.

References:

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