

## Experiences and challenges with QENS experiments under in-situ illumination

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This contribution will discuss recent QENS experiments under in-situ illumination including sample structure, specific instrument setup and desirable future instrument options. As an example, data of the orange carotenoid protein (OCP) will be presented. OCP plays a vital role in the photoprotection of cyanobacteria and exhibits a significant structural change upon photoactivation. A rarely considered aspect is the importance of internal protein dynamics in facilitating the structural transition to the active state. Quasielastic neutron scattering under (in-situ) blue light illumination was used to probe the protein dynamics of the orange carotenoid protein in the dark-adapted and in the active states, respectively. It is shown that the localized internal dynamics of amino acid residues is significantly enhanced upon photoactivation. This is attributed to the photoinduced structural changes exposing larger areas of the protein surface to the solvent and, thus, resulting in a higher degree of motional freedom. However, the flexibility of the mutant W288A assumed to mimic the active state structure is found to be different, thus highlighting the importance of in-situ experiments.

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