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Small-angle X-ray Scattering on Photo-switchable Lipid Membranes

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Light-switchable *Azo-PC* lipids incorporate a photo-sensitive azobenzene unit in a phosphatidylcholine lipid. *Azo-PC* undergoes a reversible photo-isomerisation of *cis*- and *trans*-state upon irradiation with UV, respectively visible light. The isomerization of such momomers is well understood in good solvents such as methanol. The photo physics of assemblies in water is less well understood and partly inefficient. Here, we use small-angle scattering (SAS) to analyze the structure of *Azo-PC* membranes in a physiological environment upon switching. We find huge membrane thickness differences of up to 1 nm for suited buffer conditions. Furthermore, high x-ray doses allows to switch Azo-PC into its ground (*trans*-) state 1.
This way, photolipids enable a novel approach to study and control the properties of membranes. Similar mechanisms exist for photo switchable surfactants, which can stimulate neurons or induce cell lysis in response to isomerisation. Detailed SAS studies by neutrons and x-rays help to establish control of photo-switchable molecules in cell membranes in order to rationalize their potential in nanomedicine, e.g. for membrane perforation, drug release, and cell lysis.
1 *SAXS measurements of azobenzene lipid vesicles reveal buffer-dependent photoswitching and quantitative Z->E isomerisation by X-rays*, Martina F. Ober, Adrian Müller-Deku, Anna Baptist, Heinz Amenitsch, Oliver Thorn-Seshold, Bert Nickel, Nanophotonics (2022) link

Session

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