

## **Structural Dynamics of the Competing Forces of Light and Matter**

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The microstructure of azobenzene-based and azobenzene dye-doped liquid crystals deposited on pre-aligned polymer surfaces has been studied by grazing incidence X-ray diffraction (GIXRD) at the HASYLAB synchrotron facility and by optical measurements. It is demonstrated that a high degree of in-plane (azimuthal) orientation is induced by the alignment layer.

Irradiating the sample with a laser induces trans-cis isomerisation of the azobenzene. This provides a torque when the polarisation direction of the laser light is at an angle to the alignment layer orientation, causing a re-orientation of the liquid crystal structure, directly observable by GIXRD. When the laser light is switched off, the structure re-aligns with the alignment layer during a relaxation period of several minutes. This has been observed with different kinds of liquid crystals on several types of alignment layers.

The results provide direct evidence for the structural dynamics responsible for laser-induced anisotropy as observed by polarisation holography [1], and gives an intriguing insight into the interaction of forces acting on liquid crystal molecular arrangements.

[1] Berg R.H. , Hvilsted S. , Ramanujam P.S., *Nature*, 1996, **383**, 505.

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