Two-photon fluorescence microscopy with remote focusing to visualise liquid crystal director dynamics

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Two-photon fluorescence microscopy with remote focusing (1) is used to directly image liquid crystal director dynamics. The technique is used in a manner analogous to that of fluorescence confocal polarizing microscopy in order to determine the director structure of a liquid crystal layer (2). However the use of remote focusing avoids any mechanical agitation of the device and enables high axial scan speeds yielding images of the liquid crystal layer up to every 2ms.

The system is used to study the switching behaviour of a splayed nematic device, with particular regard to the evolution of the transient symmetric H state (3), a topic of much recent interest (4,5). A typical image depicting the variation in the director with time is shown.

References:
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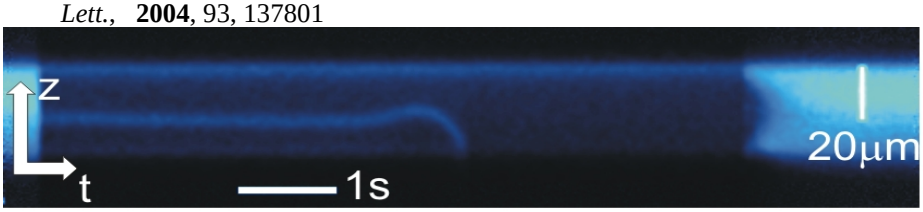

Formation of the transient symmetric H state and subsequent decay into the asymmetric H state, followed by relaxation to the splayed ground state on voltage removal. The brighter regions correspond to points in the device with the director parallel to the substrates.