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Sapphire-anvil-cell for high-pressure fluctuation correlation spectroscopy (FCS)

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**Abstract**

We designed and built a sapphire-anvil-cell to be used with a 2-photon excitation microscope. The cell, designed for pressures up to 10kbar, fits on the stage of a standard microscope. Pressure calibration is achieved by measuring a pressure dependent shift of the fluorescent lifetime of the dye JDMN (the lifetime changes from 1 to 6ns for pressures between 0 to 10kbar). The calibrant, JDMN (set in a polymer layer) along with the sample solution is placed within a perforated gasket that is sandwiched between the two sapphire windows. By focusing onto the polymer layer, the JDMN lifetime may be measured. The FCS data is collected by simply defocusing into the solution. With a long working distance objective (1cm) a solution of ~1ml may be examined using the FCS technique, where the fluorescence is collected in the reflection mode. With this technique the number density and diffusion constant of the freely diffusing fluorophores may be measured. We plan to use this instrument to study macromolecular association-dissociation equilibria.