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Investigating Anomalous Diffusion Using Fluorescence Correlation Spectroscopy NEIL ANTHONY, KEITH BERLAND, Emory University — Models used in fluorescence correlation spectroscopy (FCS) generally assume diffusion of a standard Fickian nature such that the mean square displacement (MSD,$\langle \Delta r^2 \rangle$) of the molecular diffusion is linearly proportional to time, i.e. $\langle \Delta r^2 \rangle \propto t$. In complex systems the diffusion can be anomalous, which is commonly described *via* a power law dependence of the MSD, i.e. $\langle \Delta r^2 \rangle \propto t^\alpha$. When measuring anomalous dynamics using FCS, the correlation functions are typically measured over a single lengthscale and the anomalous exponent, α, is recovered through curve fitting. The anomalous exponent accurately describes the time dependence of the diffusion over the measurement lengthscale, yet for the majority of experimental systems it has not yet been tested whether the dynamics predicted by the fit are actually observed over different lengthscales – i.e. whether or not the assumed power law dynamics truly describe the system dynamics. We investigate using scanning FCS methods that simultaneously measure correlation functions over a range of lengthscales in order to determine how accurately the physical models describe the dynamics. We use simulations to test these methods and discuss their application for measuring drug delivery rates in biomedical hydrogels.

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