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Education

B.S. in Chemistry, Changwon National University, Korea, 2002

M.S. in Chemistry, Changwon National University, Korea, 2004

Research Objective

Wonbae is working on developing High-Throughput Screening methods using Fluorescence CrossCorrelation Spectroscopy (FCCS or Dual color Crosscorrelation) which involves the analysis of fluctuating signals due to the in and out of a dye within the focused excitation volume at the level of single molecule. Before the measurement, the samples such as dsDNA & RNA should be labeled with two spectrally different dyes in order to be monitored by the fluorescence at different wavelengths. The excitation is performed by two different lasers. The fluctuating fluorescence signals are divided into two detection channels by their emission wavelengths with a dichroic mirror and filtered out by a successively long-pass and a band-pass filter. Using two single photon counting modules (SPCM), the signals are monitored at two distinct wavelengths after labeling with two spectrally different dyes. And then, the two signals are crosscorrelated by a lab-built Labview software. For example, when studying for enzyme-substrate reactions, the concentration changes by a reaction between the substrate and the enzyme-substrate molecule can be determined by monitoring the fluorescence signal fluctuations from the labeled dye. This technique could be applied to very fast drug screening test. With one excitation source, Fluorescence Correlation Spectroscopy (FCS) is also developing as a technique for measuring diffusion coefficients of fluorescent molecules. This can be applied to monitor molecular mechanisms that might give rise to fluorescence fluctuations including particle movements, conformational changes, chemical or photophysical reactions.

As like in FCS, FCCS is a powerful tool to determine interactions between different molecular species, and diverse experiments can be carried out using this technique to many different kinds of reactions such as association, dissociation and enzyme.
