

# How to Quantify Molecular Diffusion and Reaction Kinetics at Single Molecule Level? †

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† Presented at Virtual International Conference on Physical Sciences (ICPS - 2021)

**Received: 1.02.2021; Revised: 3.02.2021; Accepted: 4.02.2021; Published: 5.02.2021**

**Abstract:** Ensemble averaged experiments are widely used to study molecular diffusion and chemical reactions. However, such experiments do not allow understanding how individual molecules in solution diffuse and interact with others to perform the overall ensemble-averaged molecular processes. Developments of single-molecule fluorescence techniques have encouraged tremendous applicability to uncover intricate details of simple molecular diffusion and kinetic steps of complex chemical and biochemical reactions in solution and inside biological cells. Fluorescence correlation spectroscopy (FCS) is a technique that allows monitoring and quantifying molecular diffusion and chemical kinetics at a single-molecule level. In this talk, I will show how FCS works to monitor bi-molecular interactions and quantify the association and dissociation rates of ligands to different structures of DNA in solution. This talk will showcase how FCS as a technique can be efficiently used to study molecular diffusion and chemical kinetics at the single-molecule level.

**Keywords:** fluorescence correlation spectroscopy; DNA; chemical kinetics; molecular diffusion.

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## Funding

This research received no external funding.

## Acknowledgments

This research has no acknowledgment.

## Conflicts of Interest

The authors declare no conflict of interest.