Handling and Sensing of Single Enzyme Molecules: From Fluorescence Detection towards Nanoscale Electrical Measurements

Classical methods to study single enzyme molecules have provided valuable information about the distribution of conformational heterogeneities, reaction mechanisms, and transients in enzymatic reactions when individual molecules instead of an averaging ensemble are studied. Here, we highlight major advances in all-electrical single enzyme studies with a focus on recent micro- and nanofluidic tools, which offer new ways of handling and studying small numbers of molecules or even single enzyme molecules. We particularly emphasize nanofluidic devices, which enable the integration of electrochemical transduction and detection.