Single molecule analysis by a confined space

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A single protein molecule nanopore is self-assembled in a lipid bilayer, in effect creating a single molecule sensing interface across the lipid membrane. Target molecules could be electrochemically driven through a confined nanopore cavity to generate the interaction between target molecule and the residual of protein pore surface at single molecule level, resulting in the precise translocation information of single target molecule is observed by recording blockage of the ionic current using a home-made, low noise photo-electric electrochemical device.[1] We also investigated the translocation mechanism at different sizes, charges and substituents effect of single molecule, achieving real-time and accurate identification of single molecule interface. It showed a novel aerolysin nanopore resolved individual short oligonucleotides from mixtures and monitored the stepwise cleavage of oligonucleotides by exonuclease I.[2,3] We also fabricated a measurable electron transfer interface in nanopores to directly observing the electroatalytic reaction of a single enzyme molecule. In virtue the electric confined effect, a fundamental question that how the peptide fleets through a set of transition states who dominate the dynamics of biomolecular folding path was addressed to provide a first look at the critical experiment picture of the mechanical folding/unfolding of peptide, opening exciting avenues for investigating transition paths. Our findings explored high sensing capabilities of confined nanopore space in analyzing the interaction, the structure-function relationship, and the reaction mechanism of single molecules.

References

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