

Polyelectrolyte-Confined Nanofluidics



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Hosted by: Prof. Pengzhan SUN

Abstract

The behaviors of ion transport in confined channels are strongly related to the geometry and chemistry of channels. Polyelectrolytes are one kind of typical substrate with rich chemistry. By grown polyelectrolytes brushes onto the inner wall of micro/nanopipette by ATRP (atomically transfer radical polymerization), the polyelectrolyte brushes-confined nanofluidic configuration were successively and controllably obtained. With this configuration, several counterintuitive ion transport behaviors were observed, such as microscale ion current rectification, ion current rectification reversion for monovalent anions and ion current oscillation. Based on these fundamental behaviors, various sensors with high spatiotemporal resolution, especially for in vivo analysis, were developed. More recently, the hysteresis phenomenon was observed in polyelectrolyte brushes-confined nanofluidic. Typical three fingerprint characteristics of memristor were observed at polyelectrolyte-confined nanofluidic system. Moreover, the typical neuromorphic functions, such as PPF, PPD and dynamic filter properties were also realized. More importantly, chemical-related neuromorphic functions (i.e., chemical-electrical signal transduction) were for the first time accomplished, showing promising application in brain-mimic computing and brain-computer interfacing. We have also realized the neuron functions with polyelectrolyte brushed-confined nanofluidic with both electrical and chemical responsibility. We think the polyelectrolyte brushes-confined nanofluidic paved a way of tuning ion transport behaviors with rich chemistry and tunability, which would feature more diversity and tunability for the nanofluidic-related applications.

Biography

Prof. Ping YU is currently a Professor in Key Laboratory of Analytical Chemistry for Living Biosystems at ICCAS. She was a recipient of the “LU JIAXI Award for Junior Scientists” from CAS and the “National Outstanding Young Scholars” of China. Until now, she has published more than 150 papers, which was cited more than 13000 times with a H-index of 66. Her ongoing work focuses on confined ion transport and fluidic memristor.