# Single living cell analysis with a nanopore electrode

**Yi-Lun Ying, Yong-Xu Hu, Yi-Tao Long***

*Key Laboratory for Advanced Materials and Department of Chemistry, East China University of Science and Technology, Shanghai, 200237, P. R. China.*
*E-mail: yilunying@ecust.edu.cn; ytlong@ecust.edu.cn*

Nanopore sensors provide a highly innovative technique for a rapid and label-free single molecule analysis, which holds a great potential in detection of a target of interests in a single cell.1 However, it is hardly acted as nanoelelctrodes for probing the electrochemical substance in living cells since it lacks of electroactive interface.2 To achieve the real-time electrochemical detection of single molecule interactions and interfacial charge transfer within a single living cell, we developed a nanopore electrode with a gold-coated tip where the redox reactions occur, thus resulting in characteristic modulation of the detected ionic current through the pore. Moreover, the finite element simulations were performed to support the proposed mechanism of nanopore electrode on redox reaction analysis. Further, the nanopore electrode were modified with 4-thiol-catechol to achieve highly sensitive and selective intracellular probing of nicotinamide adenine nucleotide (NADH) as low as 1 pM. Expectedly, the probing of NADH in a single living MCF-7 cell was achieved by monitoring current signatures induced by electrocatalytic oxidation of NADH at the anode of nanopore electrodes. Therefore, the nanopore electrode provides a simple, powerful tool for probing single living cells.

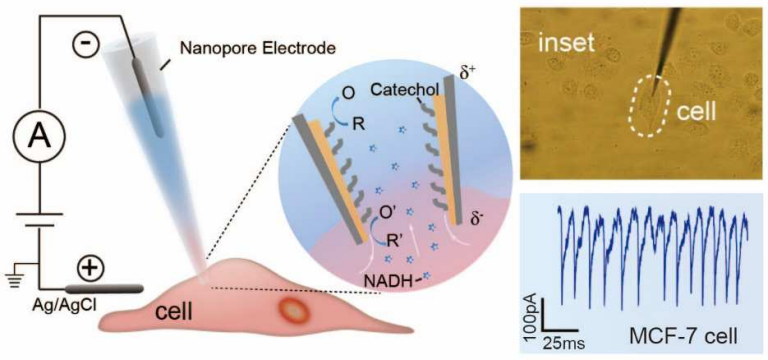


Fig.1 The illustration of the nanopore electrode for single cell analysis.

## References

[1] Y.-L. Ying, J. Zhang, R. Gao, Y.-T. Long. Angew. Chem. Int. Ed., **52**, 13154-13161 (2013)

[2] X. Li, S. Majdi, J. Dunevall, H. Fathali and A. G. Ewing. Angew. Chem. Int. Ed., **54**, 11978-11982 (2015)