

# 学术报告

题目: Single-molecule electrochemical dynamics and electronically based nanoparticle catalysis of transition metal complexes and metalloprotein electrochemistry

报告人: Prof. Jens Ulstrup  
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时间: 6月27日(周五) 下午4:00

地点: 卢嘉锡楼报告厅(202)

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6月23日

# Single-molecule electrochemical dynamics and electronically based nanoparticle catalysis of transition metal complexes and metalloprotein electrochemistry

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## Abstract

We overview recent investigations of structure and electronic function of single transition metal complexes and redox metalloprotein molecules, mapped by electrochemical scanning tunneling (ECTM) and atomic force microscopy (ECAFM). A spectroscopic feature in the tunneling current-overpotential correlations is caused by population/depopulation of the molecule redox levels. Bandshape details are determined by the electrochemical potential, bias voltage, ionic strength etc. in the tunneling gap. The degree of electronic coherence in the overall two-step conduction process is determined by the coupling between the redox group and the enclosing electrodes which strongly affects the number of electrons transferred in a single-two-step ECST event. This pattern is illustrated by s-polypyridine complexes and the bacterial heme protein cyt *b*<sub>562</sub>.

Molecular size metallic nanoparticles, AuNPs in particular are long known to act as efficient catalysts of interfacial electrochemical ET. AuNP catalysis of gas phase reactions of small molecules is understood in some detail but these notions cannot be transformed straightforwardly to the much more complex electrochemical interface. We investigate here to which extent single-molecule electrochemical and ECTM notions can be transferred to molecular size metallic NPs and offer a view towards the way the molecular scale metallic NPs may operate in simple electrochemical ET processes based on the electronic properties of the particles.

## Some recent references:

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2. E.A. Della Pia, Q. Chi, J.E. Macdonald, J. Ulstrup, D.D. Jones and M. Elliott, Nanoscale 4 (2012) 7106-7113.
3. F. Liu, K. Kamran, J.-H. Liang, J.-W. Yan, D.-Y. Wu, B.-W. Mao, P.S. Jensen, J. Zhang and J. Ulstrup, ChemPhysChem 14 (2013) 952-957.

Jens Ulstrup教授为丹麦技术科学院院士、丹麦皇家科学和文学院成员,是大分子电荷传递的实验和理论的开拓者之一, 国际著名的理论电化学家, 在化学速率理论、金属蛋白和DNA体系的电荷传递有着卓越的贡献。他所领导的研究组, 在界面电化学、SPM、生物大分子的组装和电荷传递、纳米粒子的制备和修饰等领域有着广泛深入的研究, 尤其是在电化学理论方面有坚实的基础, 实验和理论相互配合和支持, 努力将其提升到单分子科学的层次。发表了270余篇科学论文, 三本专论, 24篇综述文章和书的章节。有关成果的论文被他人引用高达到1000 余次, 多次获得国家和国际奖。