分子技術セミナーのお知らせ

バレンシア大学（スペイン）のJavier Cervera博士による単一ナノポアに関する講演会を開催いたします。ナノポアを介した化学系の電気特性に関する、興味深い研究です。添付のアブストラクトをご参照下さい。

"Single nanopores and its potential use for detectors, actuators and transducers"
Dr. Javier Cervera Montesinos, University of Valencia, Spain

日時：７月３１日（金）
　　１５：３０～１７：００（セミナー）
　　１７：００～１９：３０（共同研究のための総合討論）
　　共同研究に向けた話題提供（５～１０分／１人）
　　飲み物代 1,000円（当日　徴収します）

場所：文理融合型研究棟　７F　共通講義室３

主催：大阪大学大学院理学研究科化学専攻反応物理化学研究室
共催：大阪大学未来研究イニシアティブグループ支援事業「分子技術イニシアティブ」
　　科研費新学術領域研究「分子アーキテクトニクス」
　　大阪大学基礎工学研究科附属未来研究推進センター

問い合わせ先：理学研究科　松本卓也（豊中５４００）、大塚洋一（豊中５４０１）

Single nanopores and its potential use for detectors, actuators and transducers

Javier Cervera Montesinos (University of Valencia, Spain)

We present two studies on the characterization of nanopores and their possible use in devices. First, we analyze single cigar-shaped nanopores with pH-responsive carboxylic acid and lysine chains functionalized on the pore surface. We show that a single, approximately symmetric nanopore can be operated as a reconfigurable diode showing different rectifying behaviors by applying chemical and electrical signals. The remarkable characteristics of the new nanopore are the sharp response observed in the I-V curves, the improved tunability, and the broad range of rectifying properties. We propose then the concept of logic functions based on this nanopore and evaluate its potential use in electrochemical transducers and actuators.

In the second study, we consider the coupling of nanopores with conventional electronics elements. To this end, we explore the electrical rectification of large amplitude fluctuating signals by asymmetric nanopores operating in aqueous solution. We show experimentally and theoretically that a load capacitor can be charged to voltages close to 1 V by converting zero time-average potentials of amplitudes in the range 0.5–3 V into average net currents using conical nanopores in polymeric membranes. This process suggests that significant energy conversion and storage from an electrically fluctuating environment is feasible with a nanoscale pore immersed in a liquid electrolyte solution, a system characteristic of bioelectronics interfaces, electrochemical cells, and nanoporous membranes. We consider both single nanopore and multipore membranes to show that the conversion processes can be significantly increased by scaling.

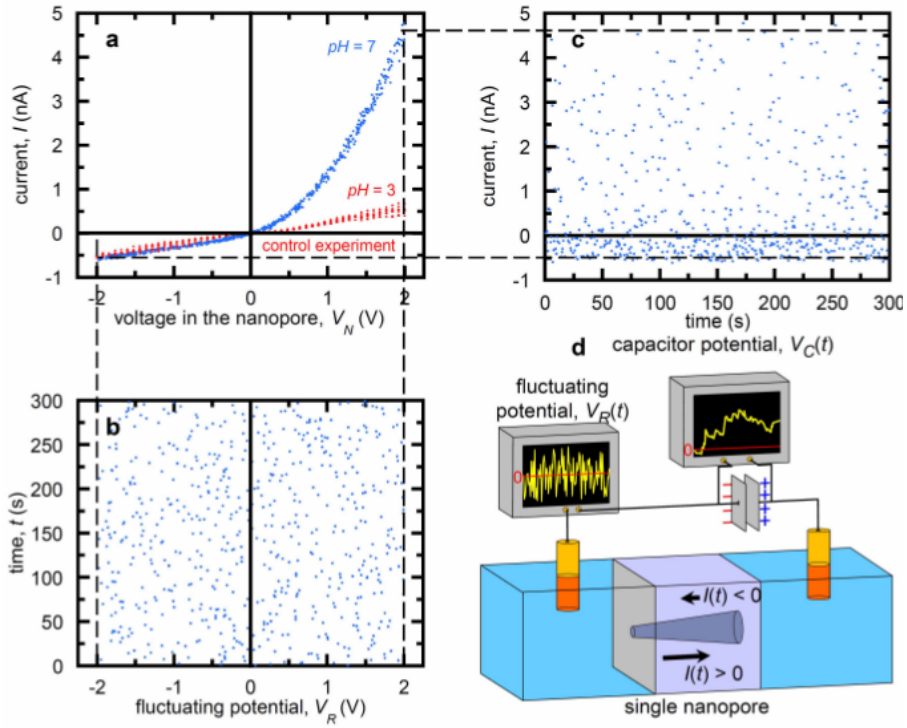

Figure 1. The conical nanopore display a rectifying current-voltage curve. This asymmetry can be used to charge an external capacitor by converting fluctuating high amplitude potentials into net currents.