“凝聚态物理-北京大学论坛”

2007-22

时 间： **2007 年 11 月 8 日（星期四）下午 15:00－16:40**

地 点： **北京大学物理大楼中 212 教室**

报告题目： **Semiconductor Nanopores Tunability for DNA Sequencing**

报告摘要：

In the recent years there has been a tremendous interest in using solid-state nanopores as a new tool for DNA and RNA characterization and possible sequencing. Among solid-state membranes the use of semiconductor materials is particularly attractive because of their electric versatility and physical robustness. In this work we present a scenario that integrates biology with MOS nano-electronics for probing the electrical activity of DNA molecules thereby providing a means to identify electronically their molecular sequences. A multi-scale approach that integrate molecular dynamics, semiconductor device simulation and circuit element modeling to simulate the DNA translocation process with single base detection on the capacitor plate has been developed, and shows that identification of single nucleotides on the biomolecule is possible. Of particular importance for optimum signal detection is the electrostatic control of the semiconductor-solution interface. By applying a voltage between the heavily doped semiconductor and the electrolyte, it is possible to invert the ion population inside the nanopore and vary the conductance for both cations and anions in order to achieve selective conduction of ions even in the presence of significant surface charges in the membrane. Our model indicates that in narrow nanopores substantial gain can be achieved by controlling electrically the width of the charge double layer.Additional ionic charge controlled can be achieved by using a membrane made of two separate n-doped and p-doped semiconductor layers that add a degree of freedom in ionic selectivity and ion current rectification, when each of the doped layers can be connected to a voltage source.

报告人： **Jean-Pierre Leburton教授**

报告人简介：

Jean-Pierre Leburton 教授于 1978 年在比利时列日大学（University of Liege）获得博士学位，此后在德国慕尼黑西门子研究所（Research Scientist Siemens Research Laboratory）进行研究工作，1981 年起在美国伊利诺依大学香槟分校（University of Illinois at Urbana-Champaign）任教，现为该校电子和计算机工程系 Gregory Stilllman 教授。已在 SCI 杂志上发表论文 260 余篇，目前是美国物理学会（APS）、电子工程师学会（IEEE）等著名学会会员，在国际学术会议上做邀请报告 80 余次。Leburton 教授主要从事的研究领域有：DNA 的电子识别技术；半导体器件，半导体中的非线性输运；量子井、异质结构及超晶格的光学和电学性质；纳米线和量子点的物理性质的研究及计算模拟。

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