NANO HIGHLIGHT
DNA Sequencing and Translocation Studies using Electrically Addressable Nanopore Arrays

NSF NIRT Grant 0403891

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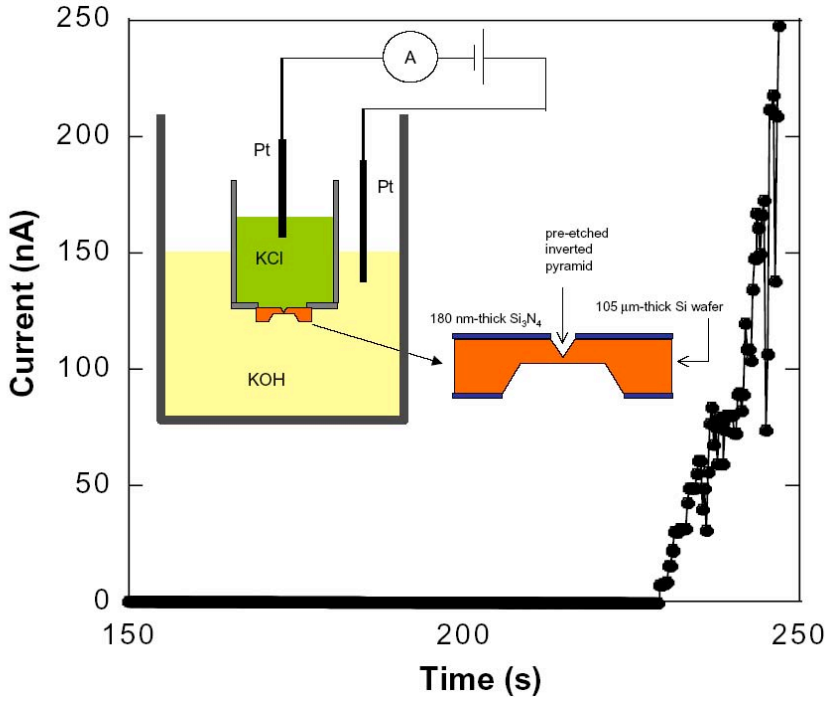
Solid-state nanopore devices are useful for many important applications in biotechnology such as DNA sequencing. However, the costs of existing methods for making these devices are prohibitively high. There is an urgent need to find a low-cost approach. In this project, we have developed a simple feedback etching method for fabricating silicon-oxide nanopores.

The basic concept behind our method is shown in the figure below. Our starting material is a <100> silicon wafer. The first step is to use standard silicon processes to fabricate an inverted pyramid with a sharp tip on one side of the silicon wafer, using the well-known techniques of anisotropic etching of Si in alkaline solutions such as KOH, or $(CH_3)_4NOH$(TMAH). After the first step, the silicon chip is mounted as a partition in an electrochemical setup separating two chambers filled with KCl and KOH solutions, with KCl on the front side with the pyramid, and KOH on the back. While KOH is etching away silicon from the backside, the electrical current across the silicon chip is monitored using two Pt electrodes, one in KCl and the other in KOH. Under proper bias voltages, it is possible to detect the opening of a nanometre-scale pore in the silicon chip at the tips of the inverted pyramid. Thus one can stop the etching process promptly and prevent over-etching. Using this method, we have fabricated nanopores as small as 3 nm.



Reference

[1] For further information about this project email **xsling@brown.edu.**
[2] S.R. Park, H. Peng, and X.S. Ling, "Formation of bi-nanopores in silicon chips", submitted to Applied Physics Letters.