NANO HIGHLIGHT

Functionalization of Silicon Nanorods for In Vivo Glucose Sensing

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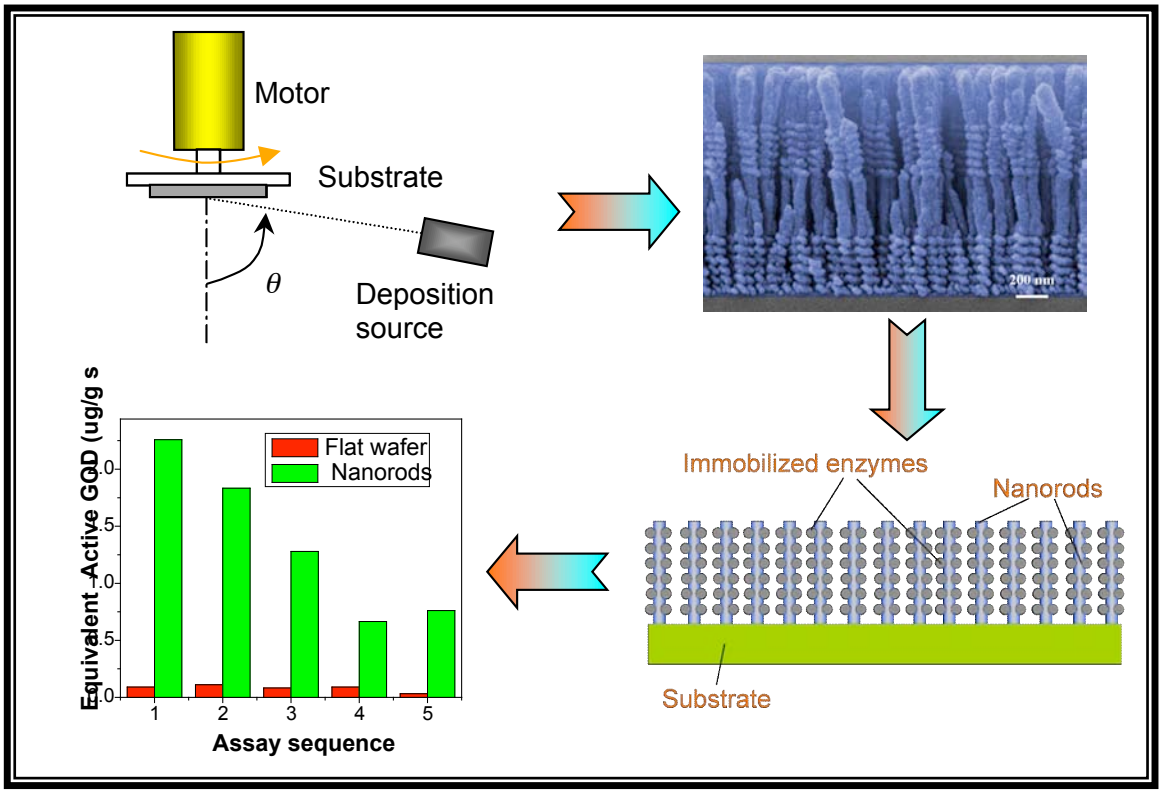
We have made advances towards the development of implantable nanoscale glucose sensors. Three-dimensional silicon nanorods were fabricated by the E-beam technique of glancing angle deposition (GLAD), see Figure below. The nanorods were functionalized by amine-silanization followed by attachment of glucose oxidase (GOD) using the homobifunctional linker glutaraldehyde. Immobilized GOD was assayed by absorbance at 450 nm based on the oxidation of o-dianisidine through a peroxidase coupled reaction. Immobilized GOD activity on nanorods ranged between 10 and 20 times higher than that on flat surfaces. Low density nanorods fabricated at higher incident angles exhibited higher activity than high density ones. This difference was attributed to deeper penetration of GOD between the nanorods that had larger inter-rod dimensions.

Despite many notable advances in the area of implantable glucose sensors for treating diabetes, there are technological issues that need addressing before the technology can be deployed. Key among these issues is sensitivity and long-term stability. The 10- to 20-fold increase in activity demonstrated so far suggests potential to solve the sensitivity problem of functionalized nanorod sensors. Additionally, work is underway to demonstrate improvements in long-term stability by passivating the top layer of the nanorods using self-assembled monolayer techniques. Passivation is expected to greatly reduce fouling that is endemic in current sensors.



References:

[1] For further information about this project link to http://www.physast.uga.edu/~zhaoy/ or e-mail to zhaoy@physast.uga.edu.

[2] Y.-P. Zhao, D.-X. Ye, G.-C. Wang, and T.-M. Lu, "*Designing Nanostructures by Glancing Angle Deposition*," SPIE Proceedings Vol. **5219**, 59 (2003).