Molecular Electronics and Transistors based on Peptide Nanostructures (Ramot)

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Ehud GAZIT, T.A.U Tel Aviv University, Life Sciences, School of Molecular Cell Biology & Biotechnology
Judith Rishpon, T.A.U Tel Aviv University, Life Sciences, School of Molecular Cell Biology & Biotechnology
Yosi Shacham- Diamand, T.A.U Tel Aviv University, Engineering, School of Electrical Engineering

The Technology

Proprietary peptide nanostructures1 can be readily fabricated on various surfaces including electrodes2,4. A physical vapor deposition method (PVD) allows the precise control on the molecular dimensions of the structures using industry standard techniques. These nanostructures were used to fabricate metallic nanowires1 as well as trilayer metal-peptide-metal nano-cables3. Electrodes and storages devices were modified with the peptide nanostructures. Recent work includes the application of the nanostructures to Ion-Sensitive Field-Effect Transistor (ISFET) with very strong responses measured, providing the basis for potential applications (to be published).
The chemical nature of the building blocks allows the simple modification with various recognition elements. This could be readily modified to recognize DNA bases for sequencing purposes.
The peptide structures are semi-conductive5,6 and possess various other unique physical properties (including mechanical rigidity, piezoelectric properties, non-linear optical properties, etc.).

Stage of Development and Patents

The technology is extensive and there is a very strong IP portfolio exists which includes the nanostructures themselves, modifications of the building blocks, filling and coating of the structures, and deposition methods. Taken together, a method for ultrasensitive detection of biomolecules by the medication of electrodes is available. The patented novel technology is compatible with industry deposition methods and could be implemented into non-optical detection of DNA sequences.

Supporting Publications

1. Casting Metal Nanowires within Discrete Self-Assembled Peptide Nanotubes. Science 300, 625-627 (2003).
2. Controlled Patterning of Aligned Self-Assembled Peptide Nanotubes. Nature Nanotech.1, 195-200 (2006).
3. Fabrication of Coaxial Metal Nanowires Using Self-Assembled Peptide Nanotube Scaffold. Nano Lett. 6, 1594-1597 (2006).
4. Self-Assembled Arrays of Peptide Nanotubes by Vapour Deposition. Nature Nanotech. 4, 849-854 (2009).
5. Elementary Building Blocks of Self-Assembled Peptide Nanotubes. J. Am. Chem. Soc. 132, 15632-15636 (2010).
6. Peptides as Biological Semiconductors. Nature 468, 516–517 (2010).

Contact for more information:

Noam Greenspoon ✉,

Ramot at Tel Aviv University Ltd. P.O. Box 39296, Tel Aviv 61392 ISRAEL
Phone: +972-3-6406608
Fax: +972-3-6406675