Patent Annotations:

The patents annotated in this section have been selected by the authors of this issue as the most important patents of relevance to their field.

MEDICAL NANOROBOT ARCHITECTURE BASED ON NANOELECTRONICS MANUFACTURING DEVELOPMENT

1. **Method and system for remotely monitoring multiple medical parameters in an integrated medical monitoring system,** ***Reuss, J.L., Kirchner, R.S.: US 20026364834 (2002).***

Commentary:

An integrated medical monitoring system comprises at least one patient monitor, one central monitor, and one remote access device which are tied together through an integrated communications link. The communications between various components of the system are bi-directional and provide data exchange between components of the system.

2. **Electronic circuit device, system, and method,** ***Rosewater, D.L., Goldstein, S.C.: US7064000 (2006).***

Commentary:

This invention describes a chemically assembled electronic device, Complementary Metal Oxide Semiconductor (CMOS), for constructing circuits of nanometers.

3. **Position sensitive power transfer antenna,** ***Jeutter, D. C. US5314453 (1994).***

Commentary:

A power supply is implanted behind a tissue barrier in a human body to operate a medical device. A high frequency power receiver antenna coil and a magnetic field sensing device control the transmission of high frequency power from the transmitter to the implanted power supply.

4. **RF System for tracking objects,** ***Laroche, J.L.: US20060250300A1 (2006).***

Commentary:

The present invention describes an RF system for tracking an object in space for position. The system comprises a transponder device connectable to the object, which adds a known delay to the RF signal, thereby producing an RF response for transmitting through the transponder aerial.

5. **Three dimensional CMOS integrated circuits having device layers built on different crystal oriented wafers,** ***Ieong, M., Guarini, K.W., Chan, V.: U2004S6821826 (2004).***

Commentary:

The three-dimensional (3D) integration schemes of fabrication described herein which consist in pre-built two semiconductor devices, which are bonded together and interconnect through wafers.

6. **Method of fabricating nano SOI wafer and nano SOI wafer fabricated by the same,** ***Park, J. G., Lee, G. S., Lee, S. H.: US6884694 (2005).***

Commentary:

This invention discusses a method of fabricating a nano silicon on insulator (SOI) wafer having an excellent thickness and evenness without performing a chemical mechanical polishing (CMP), and a wafer fabricated. This method is used for preparing a bond wafer and a base wafer, and forming a dielectric on the surface of the bond wafer.

7. **Process for fabricating polarized organic photonics devices,** ***Bao, Z., Chen, X. L.: US20036579564 (2003).***

Commentary:

This invention presents a polarized organic photonics device. It is comprised of a conductive layer or electrode coated with a friction transferred alignment material. The alignment material provided for the orientation of the subsequently deposited photoactive material such that the photoactive material interacts with or emits light preferentially along a selected polarization axis.

8. **Separator for fuel cell and method for producing the same,** ***Ohtani, T., Tsuji, M., Utsunomiya, M.: US2006068262 (2006).***

Commentary:

A separator for a fuel cell comprises a gold coated stainless steel plate. This method is used for producing a separator to prevent exfoliation and fracture of the gold covering layer and to obtain corrosion resistance and durability.

9. **Method to assemble structures from nano-materials,** ***Dubin, V. M.: US20067122461 (2006).***

Commentary:

This invention describes a method to assemble nanomaterials on a platform. The functionalized nanomaterial is disposed on an assembly platform having an electrode to form the first layer. Additional layers of the nanomaterial may be formed above the first layer to form a semiconductor device.

10. **Surfactants that mimic the glycocalyx,** ***Marchant, R.E., Zhang, T., Qiu, Y., Ruegsegger, M.A.: US6759388 (1999).***

Commentary:

A surfactant polymer is used for changing the surface properties of biomaterials. These surfactant polymers comprise a polymeric backbone of repeating monomeric units having functional groups for coupling with side chains. The methods for making the surfactant polymers are used to alter the surface properties of a biomaterial.

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RECENT PATENTS ON FABRICATION OF NANOWIRES

1. **Methods for nanowire growth,** ***Hamilton, J.M., Romano, L.T.: WO*****06016914A2** ***(2006).***

Commentary:

The present invention describes methods to produce, process, and exploit nanomaterials, particularly elongated nanowire materials. It also provides a method for producing nanowires that include a thin film of a catalyst material with varying thickness on a substrate. The method involves heating the substrate and thin film such that the thin film dissociates at the relatively thinner regions and vapor depositing a semiconductor onto the substrate to produce nanowires.

2. **Growth method for silicon nanowires and nanoparticle chains from silicon monoxide,** ***Lee, S.T., Wang, N., Lee, C.S., Bello, I.: US20016313015 (2001).***

Commentary:

The present invention discusses the silicon nanowires and silicon nanoparticle chains that are formed by the activation of silicon monoxide in the vapor phase. This silicon monoxide source can be solid or gaseous and the activation can be achieved by thermal excitation, laser ablation, plasma or magnetron sputtering. It produces large amounts of silicon nanowires without requiring the use of any catalysts.

3. **Methods for fabricating metal nanowires,** ***Penner, R.M., Zach, M.P., Favier, F.: US20056843902 (2005).***

Commentary:

Methods for the preparation of long, dimensionally uniform, metallic nanowires that are removable from the surface on which they are synthesized, involve deposition of a metal oxide to reducing the metal oxide nanowires through a gas phase reduction at elevated temperatures to metal nanowires. The nanowires may be removed from the stepped surface by embedding the wires in a polymer film, and then peeling this film off the stepped surface.

4. **Method of fabricating multiple nanowires of uniform length from a single catalytic nanoparticle,** ***Metz, M.V., Hareland, S.A., Chau, R.S.: US20067018549 (2006).***

Commentary:

The present invention discusses a method for fabricating multiple nanowires of uniform length from a single precursor nucleation particle by growing a first nanowire segment from nanoparticle and a second nanowire segment between the first nanowire segment and the nanoparticle. The first two segments have different solubility levels.

5. **Fabrication of Nanowires,** ***Pavel, K., Peter, M., Peters, K.F., Stasiak, J.: WO05038093A3 (2005).***

Commentary:

Methods for creating nanowires involve exposing the layers of material to a superlattice 100, dissolving and transferring 1610 material from edges of the exposed layers onto a substrate. The nanowire can also be prepared by exposing layers of material to a superlattice and depositing material onto edges of the exposed layers.

6. **Article comprising aligned nanowires,** ***Filas, W.R., Jin, S., Kochanski, G.P., Zhu, W.: US6741019 (2004).***

Commentary:

The present invention discribes a process for fabricating structures from nanowires that are mixed in a liquid medium, and a magnetic field is applied to align these nanowires. The liquid medium is provided with a precursor material capable of consolidation into a solid matrix, e.g., conductive particles or a metal salt, the matrix securing the nanowires in an aligned orientation.

PATENTING ACTIVITY IN SYNTHESIS OF LIPID NANOTUBES AND PEPTIDE NANOTUBES

1. **Process for fabrication of lipid microstructures,** ***Schnur, J.M., Price, R., Yager, P., Schoen, P., Georger, J.H., Singh, A.: US4877501 (1989).***

Commentary:

Formation of selected microstructures from the group of helices and tubules having predetermined shape and dimension from surfactants is discussed. The selected lipids self aggregate into predetermined microstructures.

2. **Coating and composition containing lipid microstructure toxin dispensers,** ***Price, R.R. and Brady, R.F.: US5049382 (1991).***

Commentary:

The coat composition contains an effective amount, i.e. 5 and 70 percent by weight, of metalized tubules. This coating composition when applied to a surface to be protected forms a toxic surface. It can be used alone or it can contain in a hollow core a secondary or co-biocidal agent or mixture of these agents protected by a biocidal agent carried in the core.

3. **Controlled release microstructures, Method of controlled release and controlled release microstructures,** ***Price, R.R., Schnur, J.M., Schoen, P.E., Testoff, M., Georger, J.H. Jr., Rudolph, A., Brady, R.F.: US5492696 (1996) and US20016280759 (2001).***

Commentary:

The tubules discussed in this patent contain an active agent in their lumen, and compositions containing such microtubules are effective for providing a slow and controlled release of the active agent. These microtubules are helpful in the production of coating compositions for the protection of surfaces from coming into contact with water, adhesive resins for the production of laminated wood products, and devices for dispensing pesticides.

4. **Oligoglycine compound, fibrous microtube of oligoglycine compound and process of producing fibrous microtube,** ***Shimizu, T., Kogiso, M., Masuda, M.: US6030640 (2000).***

Commentary:

The present invention describes an oligoglycine compound and process of forming a fibrous microtube, which is characterized by the following formula: MO-(CO-CH_2-$NH)_p$-CO-$(CH_2)_n$-CO-(NH-CH_2-$CO)_q$-OM. When an aqueous solution of an alkali metal salt of the lipid is allowed to stand for 2-3 weeks, a fibrous microtube body having a diameter of 1-3 µm is formed.

5. **Magnetic nanotubes,** ***Matsui, H., Matsunaga, T.: WO05108302C2 (2006) and WO05108302A2 (2005).***

Commentary:

This patent annotation describes a method for fabricating a magnetic nanotube by synthesizing the bacterial magnetic nanocrystals containing an outer layer of proteins. It can be used for cell manipulation and separation, biological assay, enzyme recovery and biosensors.

6. **Cyclic peptide tube,** ***Ghadiri, M.R.: US20036613875 (2003).***

Commentary:

Cyclic homodetic peptide tubes having a repeating D-L-chirality motif and lacking mutually repulsive side-chains are shown to stack atop one another in an anti-parallel fashion and are shown to be held together by the formation of beta-sheet hydrogen bonding. These molecular tubes provide a transmembrane channel which can be gated or ungated. Molecular tubes can be terminated with a terminal cyclic peptide having methylated amino groups in one orientation. These molecular tubes may be useful as drug carriers, molecular sieves, reaction vessels, membrane channels and other applications.

7. **Cyclic peptide structures for molecular scale electronic and photonic devices,** ***McGimpsey, W.G.: US20030144185A1 (2003), US20050124535A1 (2005) and US20056902720 (2005).***

Commentary:

A family of cyclic peptide monomers and supramolecular cyclic peptide structures described herein comprises chromophore residues which possess electronic and electro-optic properties for producing molecular scale electronic and photonic devices made from such materials. These devices help to form cyclic peptide nanotube structures from a plurality of stacked cyclic peptides comprising chromophore residues which provide electronic conductivity and non-linear optical behavior.

8. **Surfactant peptide nanostructures, and uses thereof,** ***Zhang, S., Vauthey, S.: WO03006043A1 (2003).***

Commentary:

This patent describes short polypeptides that can self-assemble to form regular nanotubes with an average diameter of about 50 nm. These peptides have 7 to 8 amino acids in structure. These peptides are very similar to surfactant molecules with a defined hydrophilic head group constituting charged amino acids and a lipophilic tail made out of hydrophobic amino acids such as alanine, valine or leucine.

PATTERNED MEDIA TOWARDS NANO-BIT MAGNETIC RECORDING: FABRICATION AND CHALLENGES

1. **Projection electron beam lithography apparatus and method employing an estimator,** ***Stanton, S.T.: US 20067050957 (2006).***

Commentary:

The method for projection beam lithography utilizes an estimator, such as a Kalman filter, to control electron beam placement. An adaptive Kalman filter can also be used to control electron beam placement.

2. **Ultra high resolution lithographic imaging and printing and defect reduction by exposure near the critical condition utilizing fresnel diffraction,** ***Vladimirsky, Y. Bourdillon, A.: US20026383697 (2002).***

Commentary:

This invention discusses exposing methods and the ultra-high resolution lithographic imaging and printing.

3. **Magnetic recording media having self organized magnetic arrays,** ***Weller, D.K., Deeman, N., Van de Veerdak, R.J.M ., Shukla, N.: US20067041394 (2006).***

Commentary:

The present invention discusses a magnetic recording disc which consists of chemically synthesized iron-platinum particles in the locking patterns to completely fill these patterns.

4. **Nanoimprint lithography,** ***Chou, S.Y.: US5772905 (1998).***

Commentary:

This annotation presents a lithographic method and apparatus for creating ultra-fine (sub-25 nm) patterns in a thin film coated on a substrate. These patterns in the thin film will be reproduced in the substrate or in another material which is added onto the substrate.

5. **Mold for nano imprinting,** ***Ling, T., Montelius, L., Heidari, B.: US 6923930 (2005).***

Commentary:

A metal mold used for nano-imprinting process comprises a firmly adhering monomolecular non-sticking layer formed from organic sulfide of the metal.

6. **Step and flash imprint lithography,** ***Willson, C.G. M.E. Colburn, M.E.: US20026334960 (2002).***

Commentary:

Forming a relief image in a structure comprising a substrate and a transfer layer formed thereon involves covering the transfer layer with a polymerizable fluid composition. The polymerizable fluid composition is subjected to conditions to polymerize and form a solidified polymeric material.

7. **Fluid pressure imprint lithography,** ***Chou, S.Y.: US6482742 (2002).***

Commentary:

An improved method for imprint lithography is presented. By using direct fluid pressure to press the mold into a substrate-supported film an enhanced resolution and high uniformity over an enlarged area is achieved.

8. **Method of orientating a template with respect to a substrate in response to a force exerted on the template,** ***Choi, B.J., Sreenivasan, S.V., Johnson, S.C.: US20067060402 (2006).***

Commentary:

Orientating a template with respect to a substrate spaced from the template helps to maintain the orientation in response to a force being exerted upon the template.

9. **Method of producing a magnetic recording medium,** ***Piramanayagam, S.N., Wang, J.P.: US20046699332 (2004).***

Commentary:

A magnetic recording medium comprises a substrate having a layer of a non-magnetic material, which can be converted into a magnetic state by converting those selected portions of the non-magnetic layer to a magnetic state by focusing beam of radiation onto the substrate to form a patterned magnetic layer comprising an ordered array of magnetic regions separated by non-magnetic regions.

MODELING THE GENETIC ARCHITECTURE OF COMPLEX TRAITS WITH MOLECULAR MARKERS

1. **Methods, software and apparati for identifying genomic regions harboring a gene associated with a detectable trait,** ***Schork, N.J., Essioux, L., Cohen-Akenine, A., Blumenfeld, M., Cohen, D.: US20016291182 (2001).***

Commentary:

The present invention describes methods, software and apparatus for determining whether a genomic region harbors a gene associated with a detectable trait.

2. **Methods for the identification of genetic features for complex genetics classifiers,** ***Frudakis, T.N: US20067107155 (2006).***

Commentary:

Methods for identifying associations between genetic information and particular genetic traits are discussed. All possible SNP combinations are selected and statistically analyzed by this method. In another approach, a directed search based on results of previous statistical analysis of SNP combinations is performed until the optimal statistical measurement is obtained.

MOLECULAR DIODES AND APPLICATIONS

1. **Monomolecular Rectifying Wire And Logic Based Thereupon,** ***Ellenbogen, J.C. and Love, J.C.: US20026348700B1 (2002).***

Commentary:

This invention describes a monomolecular rectifying wire constituting an electron donating section, an electron accepting section, and an insulating group.

2. **Monomolecular electronic device,** ***Ellenbogen, J.C.: US20026339227B1 (2002).***

Commentary:

A monomolecular electronic device contains a molecular diode having at least one barrier insulating group chemically bonded between a pair of molecular ring structures to form a pair of diode sections. This device is operated as a molecular electronic transistor, exhibiting both switching and power gain.

FABRICATION AND APPLICATION OF POLYMER COMPOSITES COMPRISING CARBON NANOTUBES

1. **Composition including nanotubes and an organic compound,** ***Davey, A. Curran, S. Blau, W.: EP0949199 (1999), US20036576341 (2003).***

Commentary:

The method for purification of nanotube soot uses a polymer of coiled structures to extract nanotubes from their accompanying material. Nanotube soot is added to a solvent which includes a coiled polymer to form a solution with extraneous solid material such as amorphous carbon settling at the bottom of the solution.

2. **Polymerization initiated at the sidewalls of carbon nanotubes,** ***Tour, J.M., Hudson, J.L., Krishnamoorti, R., Yurelki, K., Mitchell, C.A.: WO05030858A3 (2005).***

Commentary:

The functionalized carbon nanotubes can be utilized in anionic polymerization to form polymer-carbon nanotube materials. The resultant product can be used in drug delivery processes due to their enhanced strength and reinforcement for scaffolding to promote cellular growth.

3. **High conductivity polyaniline compositions and uses therefore,** ***Blanchet-Fincher, B.G.: US20067033525 (2006).***

Commentary:

The present invention describes compositions formed from polyanaline and carbon nanotubes, which exhibit enhanced conductivity and are used in electronic circuit applications.

4. **Polyvinylidene fluoride composites and methods for preparing same,** ***Niu, C., Ngaw, L., Fischer, A., Hoch, R.: US20046783702 (2004).***

Commentary:

This invention describes an electrically conductive composite comprising a polyvinylidene fluoride polymer or copolymer and carbon nanotubes. Carbon nanotubes may be present in the range of about 0.5-20% by weight of the composite. This composite is isolated by filtering the solution and drying the composite.

5. **Electrically conductive compositions and method of manufacture thereof, *Charati, S.G., Dhara, D., Elkovitch, M., Ghosh, S., Mutha, N., Rajagopalan, S., Shaikh, A. A.: US20067026432 (2006).***

Commentary:

Methods for manufacturing a conductive composition involve blending a polymer precursor with a single wall carbon nanotube composition. It polymerizes the polymer precursor to form an organic polymer. This method can be used for manufacturing automotive components, computer components, and other components where electrical conductivity properties are used.

6. **Fabrication of carbon nanotube reinforced epoxy polymer composites using functionalized carbon nanotubes, *Margrave, J. L., Khabashesku, V. N. Zhu, J., Peng, H., Barrera, E.V.: WO05028174A3 (2005).***

Commentary:

The present invention describes methods for integrating carbon nanotubes into epoxy polymer composites for the chemical fictionalization of carbon nanotubes. This method uses an attachment of chemical moieties that the chemical moieties that react with the epoxy precursor.

7. **Nanotube/matrix composites and methods of production and use, *Shambaugh, R. L.: US 7001556 (2006).***

Commentary:

A nanotube/matrix can be used to form a composite material. A drawn fiber has an increased strength over a drawn fiber formed from the matrix material alone.

8. **Polymer/carbon nanotube composites, methods of use and methods of synthesis thereof, *Harmon, J.P., Lanetra,C.M.: US2005245667 (2005), WO06073454C2 (2006).***

Commentary:

This invention identifies novel transparent composites composed of single wall carbon nanotubes incorporated into the matrix of a polymer. These composites are helpful in deep space applications like space vehicles, space stations, personal equipment used in biomedical applications.

9. **Ultrafast all-optical switch using carbon nanotube polymer composites, *Zhao, Y., Chen, Y., Zhang, X.-C., Raravikar, N.R., Ajayan, P.M., Lu, T.-M., Wang, G-C., Feist, L.S.S.: US20046782154 (2004).***

Commentary:

An ultrafast all-optical nonlinear switch comprises of a substrate and a material disposed on the substrate. The material is substantially transparent. The switch has a switching speed of less than 1 picosecond for light with a wavelength of about 1.55 micrometers.

10. **Sensing/actuating materials made from carbon nanotube polymer composites and methods for making same, *Ounaies, Z., Park, C., Harrison, J.S., Holloway, N.M., Draughon, G.K.: US2006084752 (2006).***

Commentary:

Electroactive sensing or actuating material is used for making the three-phase composite that comprises the carbon nanotubes in the polymer matrix.

11. **Embedded nanotube array sensor and method of making a nanotube polymer composite, *Ajayan, P. Lahiff, E. Stryjek, P. Ryu, C. Y. Curran S.: WO04053464A1 (2004).***

Commentary:

The present invention describes a method for producing polymer/nanotube composites which can control the density and position of the nanotubes. This controlling method can also be used to form nanosensors.

RECENT PROGRESS IN INORGANIC SOLAR CELLS USING QUANTUM STRUCTURES

1. **Strained quantum well photovoltaic energy converter, *Freundlich, A., Renaud, P., Vilela, M. F., Bensaoula, A.: US5851310 (1998).***

Commentary:

The photovoltaic cell is allowed to convert the light over a wider range of wavelengths than a conventional single junction cell by the help of quantum well. It is used to increase of the current output.

2. **Solar cell, *Tomomichi, N.: JP2005332945 (2005).***

Commentary:

The invention discusses the role of carbon as the main ingredient to improve the efficiency of photoelectric conversions.

3. **Multi-quantum well tandem solar cell, *Freundlich, A.: US6372980 (2002).***

Commentary:

The invention describes composition of a solar cell assembly designed for satellite usage with various quantum wells electrically connected in tandem configuration.