Nanotechnology

Nanotip engineering suite
This suite of six technologies enhances multiple facets of nanolithography and scanning probe microscopy. The suite features multifunctional, active probe arrays that enable nanoscale and microscale printing with multiple fluids, nanotube micromachining techniques for high-resolution probe tips, fluid dispensing systems for multiple probes, and a simple electrostatic actuation method for independently lifting individual probes in a high-density probe array.

Investigators: Chang Liu, Jian-Min Zuo, and James Stubbs

patents pending

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Tissue Factor Incorporated into Nanodiscs for Human Therapeutics
Nanodisc technology is combined with recombinant human tissue factor (TF) to create TF-Nanodiscs. Nanodiscs are “nano-scale” structures consisting of a phospholipid bilayer “disc” surrounded by a Membrane Scaffold Protein (MSP) “belt.” As the Nanodisc is formed, a target molecule — in this case, TF — is embedded into the Nanodisc in a conformation that preserves the natural structural and functional characteristics of the TF.

It is envisioned that TF-Nanodiscs can be: 1) used to stop bleeding during surgery or emergency situations through topical application via a solid support; and 2) used for patient monitoring during treatment with anticoagulants.

Investigators: Stephen Slijar and James Morrissey

patent pending

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Simplify with Microstructured Semiconducting Objects
This technology is a powerful new route to the manufacturing of high-performance thin-film transistors on plastic substrates. Free standing micro and nanoscale objects of single crystal silicon can be fabricated from bulk silicon or silicon-on-insulator wafers by lithographic patterning of resist, etching of the exposed top silicon, followed by a removal of the underlying SiO2. This form of ‘top down’ microtechnology represents an attractive route to high-performance flexible electronic systems.

Investigators: John Rogers and Ralph Nuzzo

patent pending

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U of I researchers are laying the foundation for someday being able to inject microscopic sensors into the human body — sensors that may be able to detect cancer in the earliest stages and broadcast warnings over a radio frequency.

Nanotechnology
In the News

NIH grant to fund Nanomedicine Development Center at Illinois

A $6.2 million five-year grant from the National Institutes of Health will fund the establishment of a Nanomedicine Development Center to be directed by Eric G. Jakobsson of the University of Illinois at Urbana-Champaign. The broad goal of the Illinois center - called the National Center for Design of Biomimetic Nanoconductors - is to develop a technology that combines silicon wafers with biological or biomimetic transport molecules as a foundation for devices that accomplish many of the functions of biological membranes.

Nanoparticle Production

This invention is a method for the continuous production of semiconductor nanoparticles (i.e. quantum dots), nanostructured catalysts, nanostructured metals and metal oxides, and ceramic oxide nanoparticles using ultrasonically generated aerosols of high boiling point solvents. This technology makes large-scale materials applications a reality in areas as diverse as medical imaging, coatings, cosmetics, quantum dot lasers and more.

Investigator: Kenneth Suslick
patent pending

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Parallel-Kinematics Flexure Stage (PKFS)

A flexure stage is a positioning stage in which joints are created by introducing weak or flexible areas in an otherwise rigid structure. Under actuating forces, in this case stimulation, flexing at these weak points causes the stage to move, creating the desired change in position.

This novel design generates the desired movement (or flex), without allowing the stage to rotate, and without sacrificing stability. Potential uses in many diverse fields — from microscopy and medicine to near-field optical sensing — fields of use where the utmost precision, control and reliability are critical.

Investigator: Placid Ferreira
patent pending

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Proofreading and error-correction in nanomaterials inspired by nature

Mimicking nature, this procedure can find and correct defects in self-assembled nanomaterials. In protein synthesis, nature ensures accuracy by utilizing a proof reading unit that detects and corrects errors in translation, often through hydrolysis of incorrect amino acid building blocks. In a similar fashion, this technology utilizes catalytic DNA to locate and remove errors in a DNA-templated assembly process.

Investigator: Yi Lu
patent pending

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Colloidal suspensions

Nanoparticle Haloing Technology: This technology is a novel approach to controlling particle dispersion. The process involves adding a small dose of charged nanoparticles to a colloidal suspension. Once introduced, the nanoparticles seek out and surround the suspended particles, essentially creating a “halo” or protective shield that prevents the suspended particles from flocculating. As a result, the suspension viscosity remains low, which is useful for injection drugs or in controlling the flow of materials into intricate molds.

Investigator: Jennifer Lewis
patent pending

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