



**Sandia  
National  
Laboratories**

SAND2011-9095P

**FOURTH QUARTER 2011  
ISSUE 4**

## INSIDE THIS ISSUE

**We Have a New Website!**

**Low Cost production of  
TiO<sub>2</sub> Nanoparticles**

**Small Caliber Guided Bullet**

**Magnetic Mixing**

**Strain-Tunable  
Chemiresistor**

**Newly Patented  
Technologies for Licensing**

## CONTACT:

**Alexandra Andregos**

**505.844.7456**

[techadvance@sandia.gov](mailto:techadvance@sandia.gov)

<https://ip.sanda.gov>



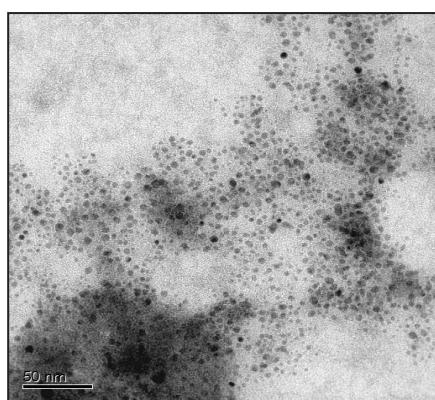
## WE HAVE A NEW WEBSITE!

Our new Licensing and Technology Transfer website went live this quarter and is now openly available to the public. The new website design implements easy navigation of the latest technologies and licensing opportunities at Sandia National Laboratories. The page gives access to a list of all current patents, detailed invention descriptions and marketing sheets, as well as an overview of licensing practices at Sandia. Though the website is active we are still working on improving a few new sections. Soon you will be just a few clicks away from our “Ready-to-Sign” patent and software licenses, which make licensing Sandia IP as easy as signing on the dotted line. The new website will also feature a “Business Plan Competition” page which details the process for academic use and lists pre-approved intellectual property ready for pursuit. Visit us now at <https://ip.sanda.gov> to see the latest innovations and readily commercializable technologies from Sandia National Laboratories.



## LOW COST PRODUCTION OF TiO<sub>2</sub> NANOPARTICLES

Sandia has engineered an catalysis and photocatalysis, numerous markets, including elegant and economically dye-sensitized solar cells and the lighting, signage, solar advantageous method to even LEDs (light emitting and automotive industries for synthesize titanium dioxide diodes). Current methods of their superior conversion nanoparticles. Titanium producing titanium dioxide efficiency and increased dioxide particles are used in a nanoparticles require costly brightness. The new method variety of settings, including surfactants and/or high of production requires only anti-reflective coatings, temperature and pressure three commercially available



Above: TEM image of TiO<sub>2</sub> nanoparticles taken at 50 kx magnification demonstrates discrete and stable end product.

processing. These and inexpensive reagents: conditions produce titanium isopropoxide, nanoparticles with isopropanol and water. The extremely broad process lasts less than 24 particle volume hours and can be done at room distributions and temperature and ambient significant particle pressure. The nanoparticles agglomeration, the produced are 5 nanometers in primary reason why TiO<sub>2</sub> has not been suited for industry use. Discrete and uniform TiO<sub>2</sub> nanoparticles show great potential in be surface-functionalized to suit a wide variety of needs.



## SELF-GUIDED BULLET

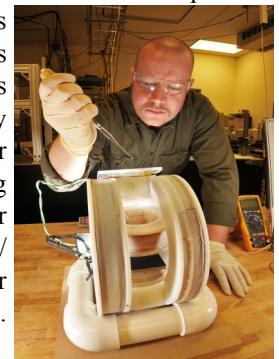


Self-guided bullets that can be fired from small caliber weapons (around .50 caliber or less) are desirable due to the increased accuracy of hitting a target from a long range (about 2000 meters or more). Sandia National labs has engineered a stimulating technology in the firearms industry. The recent innovation is a self-guided projectile utilizing a laser designated target and is configured to be fired from a small caliber smooth bore gun barrel. The nose of the bullet is equipped with an optical sensor along with stabilizing stakes and a counterbalancing mass. Guidance and control electronics and electromagnetic actuators assist in operating the control fins and also create outputs from the optical sensors in order to steer the projectile to the target. The current testing results have demonstrated feasibility of the design. We are currently seeking commercial partners who may assist in further developing and deploying our design.

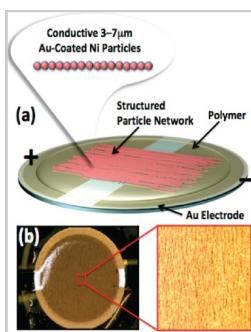
## MAGNETIC MIXING

A magnetic mixing technology has been engineered at Sandia Labs to eliminate the precautions associated with traditional mixing methods. Current liquid mixing systems in the field of biotechnology include stir bars and sonicators, which cannot induce the needed vorticity on all length scales to efficiently mix the liquid. The use of these systems requires gravity and temperature gradients to induce mixing and/or cooling which presents restraints on chemicals and environments they can be applied to. The extreme temperature sensitivity of biological systems makes these traditional mixing techniques insufficient or even hazardous. Sandia's magnetic mixing technology requires only a magnetic field to introduce mixing and/or cooling into a system. This mixing technology requires no added parts or pumps, which introduce excess hassle and/or heat into the system, causing issues for other equipment, such as optical devices.

[See it on YouTube](#)



## STRAIN-TUNABLE CHEMIRESISTOR



Chemiresistors are presence of an analyte by the swelling of trations. They are designed using popular due to their the polymer matrix within the sensor in Au-plated magnetic particles structured ability to generate the presence of the analyte, once the ana- "rapid, reversible, lyte is no longer presnt the polymer ma- and repeatable" trix returns to its normal state without any detection of permanent changes to it. This allows the for up to a 55-fold decrease in the lower flammable or chemiresistor to remain re-usable while volatile organic still maintaining a high level of repeatable chemicals. The accuracy. Traditional chemiresistors current technology require relatively high analyte concentrations to generate an appreciable sensor response. New technology could be manufactured in industrial or household safety products such as sensors to turn off a furnace when gasoline vapor is present. These chemiresistors detect the detection of analytes in very small concen-

trations. They are designed using Au-plated magnetic particles structured into conducting chains within the polymer matrix of the sensor, which, when combined with an applied tensile strain, allows simultaneously increasing the range of analyte concentration detection capabilities up to three decades. This dramatic increase in chemiresistor robustness greatly expands the usefulness of chemiresistors into fields with low analyte sensitivity and/or very limited concentration ranges.

## NEWLY PATENTED TECHNOLOGIES FOR LICENSING

## Title

- Self Assembling Software Generator
- Method for Forming Polymerized Microfluidic Devices
- Fracture-Resistant Lanthanide Scintillators
- Method for Conserving Power in a Telecommunications Network
- Mechanical Vibration to Electrical Energy Converter
- Microelectromechanical Pump Utilizing Porous Silicon
- Information-Based Self-Organization of Sensor Nodes in a Network

## US Patent #

- 8,046,742
- 8,047,829
- 7,863,572
- 8,036,720
- 7,948,153
- 7,980,828
- 8,022,987

## COMMENTS, FEEDBACK

OR TO UNSUBSCRIBE:

[techadvance@sandia.gov](mailto:techadvance@sandia.gov)

Visit our NEW website for more  
licensing opportunities:

<https://ip.sandia.gov>