DEPARTMENT OF PHYSICS,
PONDICHERRY UNIVERSITY

Special Lectures

On

Mechanical bottom-up nano-assembling and nanomanipulation using shape memory alloy nanogripper

By

Dr. Svetlana von Gratowski

Date : December 18, 2017 Time : 2.30 p.m. - 3.30 p.m.

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New functional materials for nanotechnology, biomedicine and energetic

By

Dr. Victor Koledov

Date : December 18, 2017 Time : 3.45 p.m. - 4.45 p.m.

Scientists, Laboratory of Spectroscopy and millimeter and submillimeter wave measurements, Institute of Radio Engineering & Electronics, Russian Academy of Sciences, Vvedenski Sq.1, Fryazino, Moscow region, 141190

Venue: Raman Seminar Hall, Department of Physics, Pondicherry University

All are invited

Prof. Ramaswamy Murugan
(HOD, Physics)

Dr. RAMASWAMY MURUGAN
PROFESSOR & HEAD
DEPARTMENT OF PHYSICS
PONDICHERRY UNIVERSITY
PUDUCHERRY - 605 014.

Dr. Rabindra Nath Bhowmik
Co-ordinator of the seminar

Mechanical bottom-up nano-assembling and nanomanipulation using shape memory alloy nanogripper

Dr. Svetlana von Gratowski
Scientists, Laboratory of Spectroscopy and millimeter and submillimeter wave measurements, Institute of Radio Engineering & Electronics, Russian Academy of Sciences, Vvedenski Sq.1, Fryazino, Moscow region, 141190

The numerous nanoscale materials, such as nanoparticles and nanostructures in particular, 1-D and 2-D nanomaterials: nanotubes, nanowires (NWs), etc in the past decades were discovered and intensively studied. They had appeared to demonstrate the unique functional properties allowing to construct the large number of nano-device based on individual nano-objects. Recently, these studies have led to a broad range of proof-of-concept nanoscale devices including nanolasers, nanosensors based on NWs and carbon nanotubes (CNT), field-effect transistors(nano-FETs), etc.. Such nano devicies represent attractive building blocks for hierarchical assembly Hierarchical assembly of functional nanoscale/meso-scale and macroscopic devices from nanoscale building blocks based on individual nanoscale devices offers many opportunities for creating of micro- and –macro devices and arrays by the bottom-up and hybrid paradigm. 5 steps in the bottom-up approach are production of nanodevices

1) to tailor (make) nanomaterials;
2) to etch (clean), passivate, or dope the surface of the nanomaterial;
3) to cut nanomaterials into individual components;
4) to fabricate elements and organize these elements or components into nanodevices.
5) to link (interconnect and integrate) individual nanodevices together to the micro, and macro, world.

In the presentation proposed future application of the smallest and the fastest in the World nano-tweezer is able to manipulate real nano-objects like nanotubes, nanowires, etc. Such nano-manipulation can be used nano manufacturing by mechanical nano-assembling and bottom up mechanical nanoassembling and nano-ntegration that in many cases can replaced very expensive with high running cost top-down nanolithography.

New functional materials for nanotechnology, biomedicine and energetics

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Scientists, Laboratory of Spectroscopy and millimeter and submillimeter wave measurements, Institute of Radio Engineering & Electronics, Russian Academy of Sciences, Vvedenski Sq.1, Fryazino, Moscow region, 141190

The report is devoted to the study of shape memory alloys and magnetic shape memory alloys and their applications. New shape memory dental implant will be reported. The report presents also the state of the art review of solid state magnetocaloric refrigeration (SSMCR). Recently it has been announced, that first commercial prototypes of magnetocaloric refrigerators for wide applications operating near room temperature with tenths of kW output power, 35 K temperature span and COP up 65% of Carnot cycle are developed and being presented on the market. This is the result of deep investigations performed by scientific groups all around the World of verity of solid state magnetic materials and remarkable physical phenomena, like magnetic and magnetostructural phase transitions. In spite of the valuable success, the number of the fundamental problems still arise in the field of SSMCR. Particular problems are: low, compared to conventional freons, relative cooling power of active medium; restricted frequency of cycles and temperature span developed by one stage of refrigerator and need for high magnetic fields. The study of the kinetics of the magnetic transition in high magnetic filed in the new materials in pulsed and periodic magnetic fields is believed to shed the light on the problem of the possibilities of the new prospective applications. Among them are: heat pumps and air-conditioning systems for "intellectual houses", which pretend not only to make an economy of energy from the external network, but also to consume the energy back. The new technologies of gases liquefaction, high magnetic field generation, super high speed transportation are also candidates for applications of SSMCR.