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Nano-fabrication of individual nano-devices using mechanical bottom-up nano-as¬sembling and nanomanipulation using shape memory alloy nano-gripper

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Nowadays many different types of nano-sized materials, like nanoparticles and nanostructures, especially 1D-nanotubes, nanowires (NWs), 2D-nanomaterials such as graphene etc. have been discovered and intensively studied. Nanomaterials as the bulk materials and also as single nanoobjects demonstrate the unique functional properties. Functional properties of single nanoobjects allowing to design many individual nanodevices based on single nanoobjects have been tested recently and have led to a wide range of proofs of the concept of individual nanoscale devices. Those individual nanodevices include NWs- and CNTs-based nano-sensors, FET, nanolasers, etc. Such single nanodevices represent attractive building blocks for a hierarchical assembly of micro/ macrodevices. The bottleneck of the design of such nano/ micro/macrodevices is missing of the technology for the hierarchical assembly of micro/macrodevices from those individual nanodevices.

The report suggests frontier nanotechnology for the hierarchical assembling of nano/micro/macroscopic functional devices using individual nanoscale building blocks. There are 5 main steps in this "bottom-up" approach for the production of nanodevices: 1) to tailor nanomaterials; 2) to worked out the surface of the nanomaterial; 3) cut nanomaterials into individual components; 4) to organize these components into nanodevices; 5) to interconnect and unite single nanodevices together in micro/macro World. The last 4th and 5th steps are still challenge in modern nanotechnology. In the present report the prospective applications of the new 3D nanomanipulation system based on the smallest and fastest shape memory nanogrippers is discussed. This design system is experimentally proved to provide 3D manipulation of the real nano-objects like NW, graphene etc. In the report the examples of the experimental nanomanufacturing of nano/microdevices, using alternative "bottom-up" mechanical nano-assembly. This breakthrough technology pretends in many cases to compete the manufacturing approaches based on expensive currently available "topdown" nanolithography.

Biography

Dr. Sci. Svetlana von Gratowski was born at 22 of May 1955 in Moscow region. From 1972 till 1974 she studied in Study of Moscow Institute of Physics and Technology (MIPT) (Technical University) and from 1974 till 1979 in Moscow State University after Lomonosov. She had finished this University 1979 with Dipl. Physics. From 1979 till 1984 she was in post at the post graduate courses in Institute of Radio Engineering and Electronics Academy of Science USSR. In 1984 she had got degree Dr. of Science (Solid State Physics). Since 1982 till now she is working Institute of Radio Engineering and Electronics Russian Academy of Sciences (IRE RAS). Now she is scientist researcher in this IRE RAS. Her research areas are theoretical physics in magnetism, magnetic domains, electromagnetics waves, spin waves, superconductivity, phase transitions, shape memory alloys, functional materials, multiferroics, micromechanics, nanomechanics, nanomanipulation system based on record small nanotweezers, moisture content in work of art, non-invasive monitoring of sugar in bllod. He is principila investigators of more the 20 national and international projects.

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