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## MESSAGE FROM NEIL B. GODICK

In early May, Dmitry Medvedev was sworn in as Russia's new President. His first act was appointing former President Putin as Prime Minister. Not much has changed. Not in government policy and not in business practices.

During these Russian economic boom years, foreign businesses are rushing to Russia. We are often asked by our customers: should we partner or *greenfield* an expansion into Russia. Unless there is some compelling reason that is extremely unusual the answer is *go greenfield.* Russia's press and the international press reporting on the largest transactions have a new report almost daily of a *deal gone wrong* and the western partner suffering huge losses. Business practices are different in Russia than in the US and EU. If in hind sight the Russia partner thinks the foreign partner got the better of the deal – watch out. And where does this happen most often - in the oil and gas industry where the government is the partner.

*We do not intend for these reports to solve any need our readers may have. We do intend to keep everyone current on technology developments in Russia. If you would like any additional information on any of the developments reported – send us a note.*

## Materials Sciences

**Moscow Scientists have developed the world's most precise control gage.** The gage can be used to check a device's accuracy that measures linear dimensions and operates in the micro-and nano-ranges. It is a silicon plate in which a relief (a 3D pattern of lines with precisely known breadth and depth) is etched with atomic accuracy. This serves as a reference standard of breadth and period for electronic and atomic-force microscopy.

The scientists have learned to create relief drawings on a smooth silicon crystal surface, with lines that have a precisely known length and depth and are superimposed at precisely known distances from each other. The unique character of the approach lies in that these lines can be drawn five billion parts of a meter wide.

**Scientists from A.F. Ioffe Physicotechnical Institute, RAS have developed** an approach for making composite materials with

predetermined high thermal conductivity from ultra-pure carbon. The new composites are based on natural micro and detonation nanodiamonds, fullerene, and graphite. The method used combines the source powder consisting of micro- and nano-sized diamonds with addition of fullerenes and then quickly sinters the mixture at a high temperature and high pressure. The properties of the obtained materials depend on both the composition of the source mixture and the process parameters.

The authors used materials without a catalyst. The manufacture of detonation nanodiamonds typically requires cobalt or another metal. These metals will be present in the resultant material. Attempts to make these diamond-graphite "bricks" from pure carbon have so far met with little success. It turns out that it is possible to make a monolithic material from diamond powder, the material having varied, high thermal conductivity – about 500 W/m*K (which is higher than that of copper or silver). This material can be produced only using very fine natural diamonds (actually a powder with particles sized about ten microns) and sinters for several seconds at a temperature of about 1800°C under a pressure of about 6 GPa. It will be a dense and hard composite from diamond nuclei in a graphite shell.

The scientists have learned which particular diamond powder and under what conditions it could be used to obtain a composite material with a predetermined density and thermal conductivity. Considering that the chemical resistance to these materials will be very high, it is clear that what the scientists are actually offering is a whole spectrum of new very promising materials whose properties can be regulated within a very wide range.

Nanotechnologies

**The Russian scientists have created a battery for laptops for 8-10 hours of continuous** work under 20W load. The block represents a fuel cell created using nanotechnologies.

The new battery has been developed from fuel cells, which differ from ordinary batteries by substances for electrochemical reactions to come from outside. The battery's life is unlimited (it works as long as it is provided fuel, i.e. methanol, or hydrogen) and it does not need to be replaced like batteries.

One of the important constituents of fuel cells is a porous membrane with a catalyst. This participates in the fuel decomposition reaction and electric current production. The narrower the membrane pores, the larger the contacting area with the catalyst, the smaller the element might be. A new membrane was developed by the Russian scientists using gradient porous matrix nanostructures. Prof. Trusov, director general of the Aspect Association, believes the battery for a modern laptop should weigh no more than 100-150 grams. A thin multi-layer nanostructure used in the Russian scientists' invention

resolves the issue of high energy concentration density per unit volume. The specific power is 180 MW per square centimeter.

***Nanoindustria*** **Group has developed a solution of silver nanoparticles called *AgBion*.** It is known that this precious metal kills many microbes, viruses and fungi. When the time came for active application of nanoparticles, it became possible to amplify the bactericidal properties of silver many times over. In the nanopowder form silver's surface area substantially increases and so does its disinfectant potential. This result can be transferred to other materials that are in contact with it.

The new development was tested in the underground chambers of the Archangel Cathedral in the Moscow Kremlin. Until recently, harmful microorganisms had been controlled by chlorine containing preparations. These materials have many disadvantages.
The first experiments with ***AgBion*** showed that, after treatment with its solution, the number of harmful bacteria in a hospital ward's walls and in the air decreased three times, and that of mold fungi – by five times. Now ***AgBion's*** authors are trying to find the most effective way of applying ***AgBion.*** Their goal is to provide maximum protection from mold to pictures, books, flags, leather products, as well as premises where they are stored, including basements. The disinfectant solution of silver nanoparticles is safe both for humans and for museum pieces. The new product can be used not only in cathedrals and museums, but also everywhere where there are bacteria and mold.

Health Sciences

**Researchers of the Tomsk Scientific Center have developed an experimental** a treatment for brain damage by stimulating stem cells. The method of experimental encephalopathy therapy suggested by the scientists initiates a new direction in regenerative medicine.

Diseases accompanied by developing cerebral tissue hypoxia can cause encephalopathy. They can be traumas, bleedings, and disturbance of the cerebral circulation, consequence of poisonings, encephalitis, and meningitis.

The Tomsk scientists managed to activate the brain stem cells by triggering the mechanism of their differentiation in those elements of the brain which need to be restored after each specific lesion. They have learned to simulate the activity of natural regulatory systems by introducing a cytokine preparation (originally developed by Tomsk Institute of Pharmacology together with *Vector* Novosibirsk State Research Center) in the body as a hemo-stimulant.

The cytokine preparation is capable of causing entry of stem cells into blood which does not deplete their reserve.

During the experiments, the laboratory animals with brain damage

accompanied by serious psychoneurological and somatic disturbances almost completely recovered after treatment with the cytokine preparation.

**Thrombocytes called antiaggregants are currently widely used for preventing** arterial thrombosis. The most efficient among them are covalent type antiaggregants. They suppress the functions of thrombocytes by chemical modification of molecular targets.

Specialists from the Russian State Medicine University designed covalent stable antiaggregants that are taurine derivatives. Their complex structure includes available chlorine in the chloramine atomic group that fulfills the function of covalent inactivation of blood platelet receptors. Acidic sulphonic group determines polar properties of the anti-aggregator and its capability to react with cell surface receptors. One of the chloramine anti-aggregator substances is N,N-dichlorotaurine. The anti-aggregator substance is suitable for developing a medicinal substance. The authors developed an ecologically safe laboratory means for obtaining the stable anti-aggregator in high concentration.

The covalent antiaggregants' efficiency is attributed to their two basic properties.

- A durable suppression of the thrombocyte functions, which ideally lasts throughout the cell lifetime.
- The cumulative character of small antiaggregant doses in the body. This enables its application in one-time small doses, reducing the side-effects.