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MESSAGE FROM NEIL B. GODICK

Russian President Dmitry Medvedev tried to woo world economic leaders in Davos by boasting of significant improvements in economic conditions under his watch. In a keynote speech intended to reassure foreign investors and allay fears of political instability Medvedev listed ten key areas where the Russian leadership is gradually strengthening the economy while also improving the investment climate.

#1: Russia has slashed the number of its strategic companies five-fold mainly those that cannot be privatized and those in which foreign investment is complicated.

#2: Russia is set to embark on a large-scale sell-off of state assets in efforts to modernize its country.

#3: Russia is poised to create a "special sovereign fund" to attract foreign capital.

#4: The Kremlin is pressing ahead with efforts to transform Moscow into one of the top-ten global financial centers as part of a drive to diversify the economy away from energy exports.

#5: Russia will refrain from imposing a special tax on banks and the financial sector in an effort to attract additional capital into the country.

#6: Russia's ambition to join the World Trade Organization (WTO) and the Organization for Economic Cooperation and Development (OECD), as well as to establish a common economic area with the European Union.

#7: Russia will continue the implementation of energy efficiency programs, stressing that the state would also encourage more partnerships in the energy sector.

#8: Russia is presently developing a mechanism that would help it share technology especially military technology with other nations.

#9: Russia continues to invest heavily in its human resources,

including trying to educate future businessmen and officials abroad.

#10: Russia is also pushing to interest investors in projects related to the development of sports and large athletic events in preparation for the Olympic Games.

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.

New heat-resistant steel

A novel heat-resistant steel has been developed at the **Central Research Institute of Machine-building Technology (GNTs RF OAO NPO TsNIITMASh,** www.cniitmash.ru). Due to contaminant elimination, it can stand temperatures up to 610 °C, a level earlier thought impossible.

Using the interrelation between the 'micro (nano)-meso-macro' structure and properties, the developers produced steels (more exactly a new steel class) containing nanoparticles that stabilize metal structure and properties. The new material will be relatively inexpensive - possibly within ordinary steels' price range. Additionally, it will not require radical changes to the production technology. Industrial and semi-industrial samples (in particular, pipes, steam conduits, branch pipes, rotors) have already been developed using this material. For example, the current efficiency at Russian coal-fired power units is 35–37%. By using the new materials and increasing the working temperatures to 620 °C, the efficiency it can be increased to 44–46%.

Electron accelerator to help produce nanopowder

Russian researchers from **S.A. Khristianovich Institute of Theoretical and Applied Mechanics, RAS (Siberian Branch)** (www.itam.nsc.ru), N.F. Katanov Khakass State University, G.I. Budker Institute of Nuclear Physics, RAS (Siberian Branch) and Buryat State University have developed a high-efficiency method for nickel nanopowder synthesis. The method produces homogeneous nanopowder particle size and a zero impurity level.

Deposition from the high-temperature phase was used to make the nickel nanopowders. The process begins when an accelerator-induced high-energy electron stream knocks nickel atoms out from man-made samples. A nickel atom containing gas is formed. Its temperature can be as high as several thousand degrees Celsius. The gas is transferred

to a reduced temperature region, where nickel is deposited on specially prepared substrates. Piling up, layer on layer, nickel atoms form nanoparticles. During the experiment, two particle fractions were deposited with an average size of 100 and 200 nm. The authors also developed a mathematical model to describe the nanopowder production process. They claim that 'real factors affecting the synthesized nanoparticle size could be changes in the spatial atomic concentration and cooling rate'.

Russians propose inexpensive solar batteries

Researchers from **D.V. Skobeltsyn NII of Nuclear Physics, Moscow State University** (www.sinp.msu.ru) and Kvark science-and-production company produced LGCell solar cells from multicrystalline non-structured silicon. The experimental samples' efficiency was 15.9%. The overall efficiency for their multicrystalline silicon batteries is no higher than other power cells but their production cost is significantly lower.

The authors manufactured experimental LGCell photoelectric cell samples. They also studied the atomic hydrogen treatment process. The scientists first hypothesized, and later proved, that this treatment produces relative ordering in the multicrystalline silicon structure and enhances battery efficiency. The semiconductor plates produced were used as a base to develop experimental solar cell samples. The first tests showed that the battery efficiency decreases upon illumination with short-wavelength light (about 300 nm). The scientists suggest that this dip is associated with the battery surface layer structure. The scientists also demonstrated that chemical surface etching leads to a significant increase in photoelectric cell efficiency. After upgrading, the photo-efficiency for their LGCells was as high as 15.9%. This is similar to the world class 16.1% for comparable solar cells.

Nanosized catalysts for pharmaceuticals

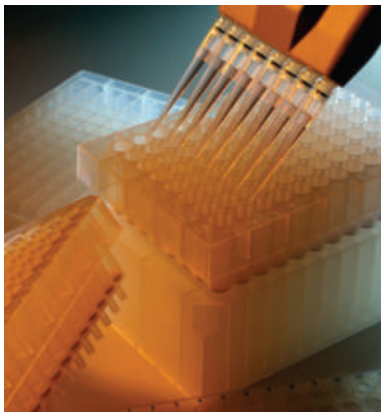
Chemists from **A.N. Nesmeyanov Institute of Organoelement Compounds (Moscow) and Tver State Technical University** developed methods for forming mono-(Pt, Ru, Pd), bi-(Pt-Pd, Pt-Ru, Pd-Ru) and trimetallic (Pt-Pd-Ru) nanoparticles in cross-linked polystyrene pores. This results in active, stable and selective nanocatalysts for synthesizing vitamins, food supplements and pharmaceuticals.

These nanosized catalysts are scientifically interesting and have practical applications.

Using nanosized catalysts based on cross-liked polystyrene is economically viable (polystyrene is inexpensive). According to the developers, these high-efficiency nanocatalysts for oxidation processes can be used to solve other pharma industry challenges. For example, the nanocatalysts can be used to produce injectable insulin solutions by using phenol and its derivatives as stabilizers and preservatives. Metal-containing nanosized systems also showed good potential for catalytic wastewater treatment to remove phenol-type compounds.

New microfluidic simple method for nucleic acid isolation

Nucleic acid isolation is a multistage and labor-consuming process. It can be automated but robotic systems are expensive, while their simplified versions cannot ensure the required material purification quality. Researchers from **V.A. Engelgardt Institute of Molecular Biology, RAS** (www.eimb.ru) have developed an automated device for isolating DNA from biological samples. Their microfluid module is a small transparent unit. Within it the material moves along thin channels being exposed to appropriate reagents.



All the process stages occur within the module. A blood drop (or any other biological fluid) is introduced at the input and a test-tube with purified DNA as the output. The purification process includes several stages. A liquid sample placed in the inlet chamber is filtered. Cells and virus particles remain on the filter membrane. They are treated with enzymes that destroy the cell walls. Then the intracellular matter is passed through a microcolumn filled with a sorption agent which

binds nucleic acids. Then the column is washed with ethanol-containing solution, and remaining salts and proteins are removed from the sample. During the last stage, nucleic acids (purified from remaining cell pieces) are moved to a standard test-tube. Unlike most other purification methods, the microfluid module technique maintains sample isolation from the environment at every stage. This prevents material contamination and ensures personnel safety from exposure to pathogenic microorganisms. The module helps isolate DNA from various samples: blood, saliva, liquid bacterial cultures, technogenic-origin etc. Low cost and user-friendliness make these devices highly suitable for application in various medical and pharmaceutical laboratories.

Cold plasma defeats bacteria

Russian and German scientists have invented an unusual alternative to antibiotics. They showed that infection can be defeated by argon plasma whose temperature is lower than 35-40 °C.

This approach eliminates 99% of microorganisms after treating a Petri dish for five minutes. There were slight variations in the results depending on the bacteria type and strain. The group including biologists and physicists was headed by **Svetlana Yermolaeva from the Laboratory of Infection Pathogen Ecology, N.F. Gamaleya NII of Epidemiology and Microbiology** (www.gamaleya.ru). An experiment on rats showed that, after ten minutes, even antibiotic-resistant microorganisms (*Pseudomonas aeruginosa* and *Staphylococcus aureus*) on the wound surface started to die. A five-day treatment regimen completely eliminated *P. aeruginosa* (two days earlier than in the control group). Moreover, exposure to plasma accelerated wound healing in laboratory animals. Another advantage is that the ionized gas jet can be directed precisely at the infected spot and minimizes affecting adjoining tissues.