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MESSAGE FROM NEIL B. GODICK

As Prime Minister and President of Russia, one of the greatest achievements of the Putin administrations is the creation of the middle class.

Never in Russian history is life so good for so many. Economists and sociologists estimate the middle class now comprise between 20 and 25 % of the country's population. Further, President Medvedev stated that his goal is to increase the middle class to 60% to 70% of the country's population by 2020.

Russia's economy has grown at approximately 7 percent a year over the past several years. In late Spring 2008, the economy began cooling off. This slow down started before the world wide financial crisis spread to Russia. The invasion of Georgia, statements by Putin threatening business, tax change proposals, and capital flight all preceded the stock price declines, the fall of crude oil prices, and credit tightening.

Despite all of this, though reduced, the Russian economy in 2009 is expected to grow 3%.

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.

Biotechnology – Sensor Plant

Novosibirsk scientists from the Institute of Cytology and Genetics, RAS (Siberian Branch) have developed a transgenic plant which determines levels of environmental contamination from heavy metals. Academician Nikolay Kolchanov, Director of the Institute said, “This transgenic plant is a so-called *sensor plant*. When the plant is placed on a window sill, spots will appear on its leaves when the environment is contaminated with heavy metals.” According to him, this is an absolutely new area, which the Institute’s scientists dubbed *folk ecology*.

Kolchanov also noted that the plant’s genetic program was changed by using gene engineering. This plant is capable of being substituted for modern technical devices. “If you have about twenty such plants, you can make judgments about the environment”, he added.

The Institute has also developed a new-generation fuel from grass.

Oil Contamination Cleanup

Experts from the **Novosibirsk Bio-Asphalt Holding Company** have developed a product that decomposes oil contaminations. *Degroil* is an effective biodegradation agent. *Degroil* has an extremely complex chemical structure containing enzymes, simple and complex sugars, protein and amino acids. *Degroil* applied to oil and oil product contaminated soil lowers the soil's contamination level by tens of times in just a few weeks. In terms of efficacy and safety, *Degroil* is on a par with other preparations in the marketplace. But, *Degroil*'s lower price affords users considerable savings.

Degroil operates within a wide temperature range, in various climatic regions, and with various soil and rock formations. *Degroil*'s ability to work in these wide ranges favorably distinguishes it from most oil-degradation agents present on the market. *Degroil*'s ability to be effective in such diverse conditions result from its action mechanism - the complex chemical formula. *Degroil*'s formulation results in emulsifying and dissolving oil products. Once this happens the soil's native bacteria becomes effective.

Degroil does not require complicated application scheme or expensive application devices. Dissolved *Degroil* it is applied as a 1:20 concentration in water. Application is by any convenient method - spray, pour from a water cart or garden pumps, or any other method to distribute the solution over the soil surface.

Degroil it is ecologically pure, and safe for humans and animals.

Materials Sciences – Thick Diamond Films

Researchers from Siberian Federal University in association with their colleagues from the Institute of Chemistry and Applied Chemistry (Siberian Branch, Russian Academy of Sciences) have developed a method for growing thick diamond films. The researchers have managed to obtain amorphous films with ordered orientation of diamond molecules.

The Siberian scientists developed diamond crystals in the form of a combination of the Diam diamond nanocubes. Each of the cubes consist of 104 carbon atoms. Such ideally identical cubes can easily pave any surface and both a monocrystal and a diamond film can be assembled from them.

Superdispersed diamonds are obtained via explosion of carbonic substances. To grow a thick diamond film, the developers obtain a combination of diamond nanocubes with potassium hydroxide and anneal it at the 300°C. Alkali well refines diamond particles surface from admixtures. The potassium hydroxide is then washed out with distilled water, which forms as a result nanodiamond water dredge. Most of this dredge accumulates on the bottom, thus forming a phase that can be called liquid phase. Above it, there is a phase that consists of the Diam diamond molecules, freely floating in the water. In this phase the developers precipitated on chips of silicon crystals heated up to 300°C.

Diamond cubes suspended in the water drip on the substrate and spread upon it, forming a film. Some film samples turned out to be rather thick – about 1,000 Angstroms.

Preliminary testing proved that the thermal conductivity of surface areas with the film is twice higher than that without a film. The films are resistant to acids, they do not dissolve in the hydrofluoric acid. Adherence energy and film solidity are also very high: they can be hardly taken off by a metal file, as it glides and breaks silicon under strong pressure.

New Composite Like Polyethylene

A new composite material was developed by scientists from **N.N. Semenov Institute of Chemical Physics, RAS** (Moscow). Outwardly it is like polyethylene, but more rigid and primarily much more resistant to elevated temperatures. These features are imparted to the composite by a laminated mineral with the exotic name of montmorillonite (from Montmorillon – a small place in France). There is very little mineral in the composite, and it was challenging to introduce a few percent of it into the polymer matrix. Their synthesis method makes it possible to solve a problem that had earlier seemed insoluble – to combine in a single whole a polymer and a filler of absolutely different chemical natures, and at the same time preserve the layered structure of the mineral.

There is a desire to improve the properties of polyethylene. Its resistance to heating is extremely poor: it is easily deformed, and the main problem is that it easily catches fire and quickly burns leaving little trace. With more polar polymers, like PVC or polyesters, it is much easier to introduce almost any amount (up to 90 %) of mineral fillers, for example, marble chips. This results in rigid nonflammable materials.

The filler used by the developers is a mineral consisting of multiple layers, like a thick stack of unbound sheets of paper. The material is not a natural mineral; the distance between layers is greater than in the source mineral, and the surface of the layers is modified. A portion of the surface layer sodium cations are replaced with organic, more hydrophobic cations. The next step is to first impregnate the mineral with a catalyst (to introduce it into the interlayer space by adsorption), and then polymerize the ethylene.

As the catalyst is located on both external and internal surfaces of the mineral layers, the polymer is formed in the same place. The multilayered filler becomes tightly bound into the polyethylene base. As a result, a composite material is formed where, within the polyethylene bulk, there are evenly distributed nanolayers of montmorillonite. This material like any clay will not burn and will not expand at heating.

The scientists have carefully studied the material's structure properties. The scientists found that, by using various modifications of the mineral and synthesis parameters, it is possible, within limits,

to obtain a material with pre-determined structure and properties. The introduction of 1-3 vol.% of montmorillonite results in a substantial reduction (in comparison with polyethylene) of the gas permeability and combustibility of the composite obtained. This additive also increases its heat stability. However, if it does catch fire, it will burn slowly, turning, as it were, into a laminated piece of coal. The developers have discovered the mechanism of to make polyethylene into a composite that is thermostable and low-combustible, and thus safer and more versatile.

Capturing Natural Gas

Scientists at the Nuclear Physics Scientific Research Institute in the Western Siberian city of Tomsk developed a new method for capturing natural gas that emits during oil deposit development. Advanced nanotechnology is used to reprocess the gas. The installation consists of a universal reactor, ultra-high frequency plasmatron that produces carbon, and membrane particle filters. The method makes it possible to use casing-head gas and to capture it before it is emitted into the atmosphere. The technology produces carbon with high content of nano-particles and pure hydrogen. These products are being used as raw materials in the chemical industry to make strong and wear-resistant coverings.

Health Science – Self Care

A group of scientists from **Moscow State University** developed a new medical device that will allow a patient to complete his own blood tests and inject drugs. The *automatic syringe* injects drugs, takes blood samples, and gives the results without nurse or other trained personnel assistance. The invention solves several problems:

- It avoids pain in the finger piercing process for in taking blood
- It creates a sterile condition
- Analysis' results are more precise.