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MESSAGE FROM NEIL B. GODICK

Russia is in denial. It's government is saying that the world wide financial crises is under control while its currency and stock market are in free fall. Consumers are even worse.

Gas guzzling cars are selling in Russia defying trends in Europe and the US.

Image-conscious consumers can't get enough of big cars – there is a 40% increase in year to year sales. Though road conditions and weather might rationalize an increase in sales for big cars – that's not the whole reason. Russia's lifestyle is spurring sales – a disregard for enviromental issues and economics.

Higher oil prices have done nothing to diminish the appetite for big cars. Add to that - auto makers and consumers who have to adhere to increasingly strict emissions standards present in Europe and the US do not have the same requirements in Russia.

What is the trend? The market for foreign goods, in particular, luxury goods has been unlocked. Pent-up demand from people who, in Soviet times, weren't able to express themselves through fashions or association with brands has been unleashed.

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.

Health Sciences-Artificial Skin

A Russian research and production company has developed a technology for producing artificial skin. The technology is marketed under the name *Viogel*. *Viogel* can be used in medicine to:

- treat burns, surgical wounds,
- in cosmetology, plastic surgery, dermatology,
- and for protecting hands and the face in industrial production facilities and when working in severe climatic conditions.

Viogel possesses antimicrobial and wound-healing action resulting in wound surfaces that heal without forming scars.

The artificial skin *Viogel* is based on chitosane - a product obtained by processing a chitinous slurry of crabs and mollusks and is 0.2 mm (or more) sheet hydrogel. *Viogel* has high elasticity (it can withstand six fold stretching) as well as breaking and compression strengths. *Viogel* can take any form: flap, bandage, glove, sleeve, stocking, shirt, breeches, overalls, etc.

Viogel is transparent. This quality allows monitoring of the wound's surface healing process. *Viogel* adsorbs the by-products of tissue decay and toxins. It can contain/deliver any water soluble medicinal preparations that affect damaged tissues. It is possible to make injections through *Viogel* (whereupon the injection aperture in it is hermetically closed) and to perform electrophoresis. *Viogel* is easily permeable for liquids and air thus preventing necrosis. *Viogel* maintains physiological humidity at the level necessary for normal cell migration and restoration of the epithelium. This effect is achieved while not allowing microorganisms pass through. *Viogel* absorbs liquids released from wounds in a volume that is 9-10 times greater that its own volume.

Materials Sciences - Diamond Films

Russian researchers are investigating the diamond structure and developing new technologies for obtaining diamond films.

Researchers from Siberian Federal University with participation of their colleagues from the Institute of Chemistry and Applied Chemistry (Siberian Branch, Russian Academy of Sciences) have conducted experiments on growing thick diamond films. The researchers have managed to get amorphous films with ordered orientation of diamond molecules.

The many unique characteristics of diamond make it a potentially very important coating material – very hard material, very low thermal coefficient of expansion, chemically inert, low friction coefficient and high thermal conductivity, and optically transparent over a wide spectrum range. Continuous diamond films can be used as a chip substrate for heat removal, as abrasives and coating for cutting tools. An extra-hard diamond film is able to protect movable parts of mechanisms from abrasion. Due to its optical properties, the diamond film can serve a protective coat for infrared optical instruments and devices under unfavorable environmental conditions.

The Siberian researchers work with any diamond crystal in the form of a combination of the diamond nanocubes. Such ideally identical cubes can easily cover 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 researchers get a combination of diamond nanocubes with potassium hydroxide and anneal it at the 300°C. Then potassium hydroxide is washed out with

distilled water, which forms as a result nanodiamond water mixture. Most of the nanodiamond suspension accumulates on the bottom, thus forming a phase that can be called liquid phase. Above it is a phase that consists of diamond nanocubes, freely floating in the water. This liquid phase is allowed to contact silicon crystals heated to 300°C.

Diamond cubes suspended in water drip on the substrate and spread upon it, forming a film. The film thickness increases at a rate of about 1 Angstrom per second. The result was film samples up to 1,000 Angstroms thick.

Preliminary research has show that the thermal conductivity of surface areas with the film is twice that as the same substrate 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. All these demonstrated to a certain extent the availability of a diamond film, possibly, even a monofilm. The researchers continue to work on perfecting the method.

Material Sciences-Friction Regulator

A small Rostovoblast enterprise developed technology to electronically regulate friction. The technology reduces the friction coefficients and increases efficiency thereby increasing lifetime of machines, and decreasing the power requirement for the equipment. The friction regulator is adaptable to many applications.

Until now three methods have been used for decreasing the friction and wear levels in machinery:

- applicating new more effective antifriction materials,
- including various additives to lubricant compositions; and
- upgrading the designs of both the friction units and machines and mechanisms as a whole; optimization of the operating modes.

This device exerts an influence that surpasses, in its total effect, the earlier known ways for combating friction and wear. The technology's results demonstrate:

- a reduction in the friction coefficient 2-3-fold,
- a reduction in the wear by as much as 30% (depending on the load-speed factor),
- a reduction in the intensity of various aspects of wear – from fatigue to abrasion. This is not seen when using the known methods of wear reduction.
- a substantial decrease in power consumption.

The convenient footprint, 35x40 mm, makes it easily adaptable to many friction units.

Physics-Roto

A group of inventors from Novosibirsk have developed a kinematic

Compressors

scheme for a rotor compressor. The rotor compressor design provides a tenfold reduction of metal consumption (20-30 kg against 200-300 kg). The design provides oil free air compression. The pump works either as a compressor or as a vacuum pump. The device provides for a high pressure drop. The compressors are used for producing liquefied gases and providing gas-expansion capabilities for cooling applications. This rotor-blade compressor simultaneously realizes the advantages of machines that affect:

- the potential energy of gas - piston devices,
- the kinetic energy of gas, and minimizes the disadvantages of both types of machines

Physics-Optical Antenna

A Kaliningrad oblast company has developed a:

- hybrid optical antenna based on a hemispherical mirror and
- a combined linear irradiator
- multi-mirror antenna systems based on spherical and circular cylindrical diffraction antenna lattices.

These systems combine the advantages of optical-type antennas (in terms of the level of antenna gain) and antenna lattices (electronic scanning by a directional diagram). The antennas meet the requirements for the preset level of lateral lobes. The antennas allow for the combining the frequency ranges in one antenna and polarization selection of radiated/accepted signals.

The spherical optical-type antenna includes both the basic irradiator exciting the central aperture field, and an additional irradiator for surface electromagnetic waves. The diffraction antenna lattice consists of a set of coaxial mirrors with a total aperture plane having a circular cylindrical or hemispherical shape, and a linear irradiator produced in accordance with the integrated microwave frequency technology. Each diffraction element of the lattice formed by adjoining mirrors and an irradiator segment is an isolated electrodynamic device that can operate both independently on its carrier frequency and field polarization, and as a part of an antenna system, i.e. diffraction antenna lattice.