PHLburg Technologies, Inc.

1275 Drummers Lane
Suite 101
Wayne, PA 19087

Telephone: 610-688-6800
Fax: 610-975-5800
Website: phlburg.com

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MESSAGE FROM NEIL B. GODICK

Another topic we have written about is Russia's public health system. The following is an update.

Most Russians are unhappy about the quality of available medical services. Officially, medical services are free. In reality, even retirees and the disabled have to pay. In a recent survey, 65 % of Russians reported that they have to spend their money on ostensibly free medical treatment.

A Muscovite that needed surgery told us – "I needed surgery, not a very complicated procedure. The procedure according to Ministry publications is to be absolutely free. The surgeon at the hospital advised me that my husband, who was to bring our medical insurance card, should not forget to complement it with $800. When I replied that my family had no cash to spare, a second doctor with the surgeon shouted: "Go and borrow we expect our fee! You patients have no shame at all! And what am I, the anesthesiologist, to do, pay from my own pocket?"

Not all physicians are this way. An allergist, holding an advanced post-doctorate degree, says, "I cannot take anything but flowers or a box of sweets from my patients. After all, I was brought up in the socialist era where medical care was truly paid by the State. But I am the only black sheep in my *medical family*. Colleagues keep casting suspicious looks at me. And, I have to constantly seek odd jobs on the side to survive."

It has become a *general rule* for Russians' in any medical facility for any type of medical treatment, even if the treatment is covered by medical insurance, the treatment will have to be paid for by the patient.

The Health and Social Development Ministry last summer declared a war on "pocket money". Beginning in the summer each written complaint about the extortion of illegal payments at a health service facility is to be considered within a three-day deadline and handed over to the federal health and social development watchdog for scrutiny. For the public, there have been negligible results.

From analyzing medical statistics, during the seasonal flu and respiratory illness surge many Russians prefer to take care of themselves on their own, without going to the doctor. These people

believe, any visit will require consider spending.

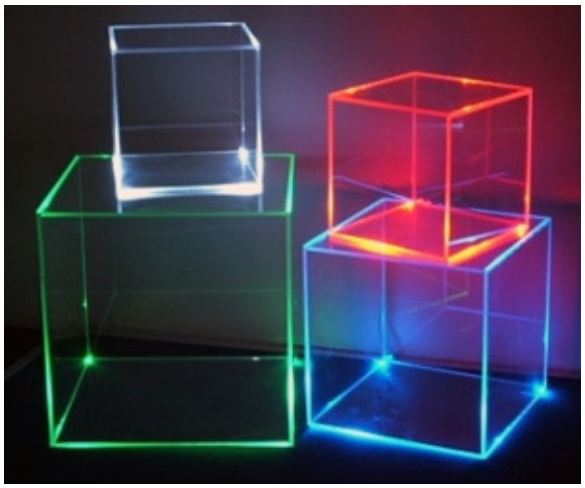
The Government promises that by 2011 health care will be better. They promise the rate for mandatory medical insurance paid by employers will go up more than 50 percent and doctors will be receiving more money. The increase in funding will come from an increase in the rate of mandatory medical insurance. The rate is to go up 50 percent from 3.1 percent to 5.1 percent.

Russia is behind the industrialized countries in health service spending-to-the-GDP ratio. In Eastern Europe nearly 6% of the GDP is spent on the health service, in Western Europe, about 9%, and in the United States, 14%. In Russia, government spending on the health service went up from 2.6% of the GDP to 2.9 % in 2006-2008.

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.

Plexiglas film is now smoother

Poly methyl methylacrylate (PMMA) popularly known as Plexiglas is widely used in various science and engineering areas. It is actively used in nanoelectronics as an electron, UV and X-ray-sensitive resist. It is often used in micro and nanoelectromechanical systems as a structural material. PMMA has shown itself well in transplantology as a nontoxic biocompatible material. It is suitable for making artificial human organs (lenses, contact lenses, dentures, bone cement).



It is important to modify the PMMA surface as to make its parameters precisely meet the device's concrete needs. One polymer parameters that substantially affect device performance is the nanoscale surface roughness. When a PMMA film is used as a resist, its surface thickness and roughness determines the minimum element size obtainable by nanolithography. If PMMA is used as a structural material in micro and nanoelectromechanical systems, the friction surfaces' relief will determine the acting friction force. This determines the miniature mechanism's friction-related energy and

thermodeformations. For manufacturing microfluidic devices, the micro and nano-channels' surface quality determines the character and flow rate of liquids used in the device. In medicine, by changing a transplant's surface roughness, it is possible to influence certain proteins' selective adsorption. This will enhance the artificial organ's biocompatibility.

RAS Lukin Institute of Physical Problems (Zelenograd) has developed and tested a technique for smoothing the PMMA-surface roughness in the nano and subnano-range. The technique is based on vacuum UV irradiation with 124 nm light.

During PMMA sample irradiation the incident photon energy is sufficient to break intermolecular bonds in the polymer. Moreover, exposure to UV produces chemical reactions stimulated by light quanta (photolysis). Polymer molecule spalls, together with volatile photolysis products, are continuously removed from the working chamber by a vacuum pump. The processes arising during UV-polymer interaction smoothes the nanoscale surface roughness. A key treatment advantage is there is no need to heat the sample. Modification occurs only in the thin surface layer without affecting the whole polymer volume.
#2010-02-067

Siberian liana will set you at ease

RAMS Siberian Branch Research Institute of Pharmacology (Tomsk) developed an original notropic phytopreparation based on perennial Siberian liana (*Atragene sibirica L.*). Unlike synthetic notrops used in the treating mental and neurological disorders, this vegetable-origin drug will have side effects. This development is novel in that no one has used Siberian liana for this purpose either in Russia or abroad.

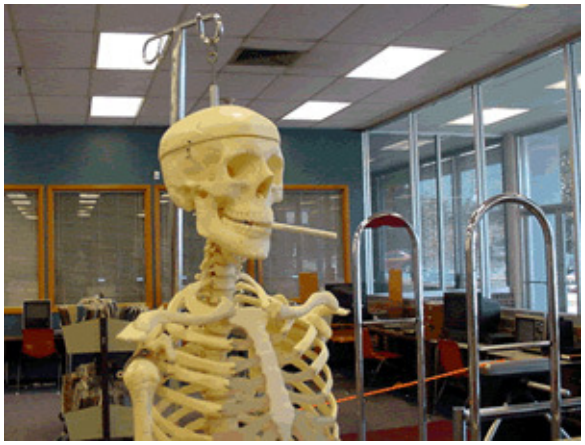
Siberian liana genus plants have long been used in folk medicine,

including Tibetan medicine. It is used to treat cardiovascular diseases and epilepsy. It is also used as a pain-killer and a restorative (especially under high physical and mental loads). The problem is that the Siberian liana field reserves are very small and difficult to access. It grows only in Khakassia, Ural Mountains, Altai and the Russian Far East.

This dwarf liana cannot be propagated by seeds in a bed or in the field in the same way as, e.g. St.-John's wort or valeriana. Its limited source of raw materials and biological growth features explain the need for developing a cellular culture in vitro. To date, stable Siberian liana cell cultures have been established. They can produce physiologically active agents. Conditions for optimizing their production process have been selected. There are examples using the cell culture to produce vitamin E and essential oils from lavender. It is important that the cell culture is able to synthesize much more material than the plant in nature. The extract obtained from a Siberian liana suspension culture has notropic properties with activity equivalent to its analog from natural raw materials. It enhances higher nervous activity under intensive training loads, after hypoxic traumas and, under experimental brain ischemia.
#2010-02-068

New construction for osteal tissue restoration

RAMS Medicogenetic Research Center and RAS Research Institute of Human Morphology (Moscow) have developed a new engineered tissue construction for restoring osteal tissue defects in stomatology, maxillofacial surgery, traumatology and orthopedics. The construction is a porous foam-ceramic carrier from the “zirconium oxide – aluminum oxide” system. It is populated with multi potent stromal cells from human bone marrow. They differentiate into cartilaginous and osteal tissue cells and release factors that stimulate body tissue restoration. The carriers increase the cell survival rate during transplantation.



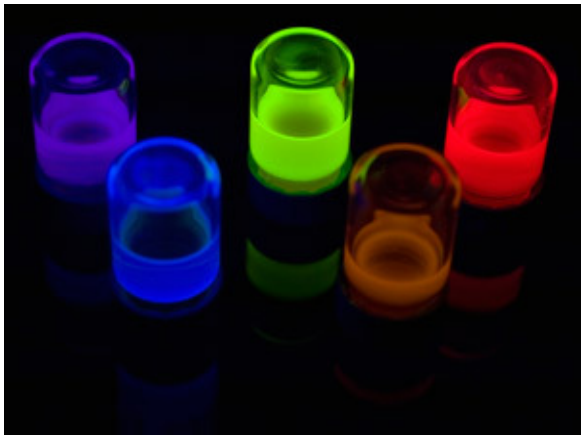
The cell carriers are constantly upgraded. A porous structure is the optimum choice for them. It corresponds to the spongiform osteal tissue structure and allows blood vessels to grow through it. Owing to pores, donor cells populate the entire carrier volume. The body’s own cells can get inside. The authors studied “zirconium oxide –aluminum

oxide" foam ceramic's properties. The material is insoluble in the body. Depending on the osteal defect geometry, the existing technologies can be used to prepare samples with preset dimensions.

Modern medicine widely uses carriers based on hydroxyapatite and animal collagen. Unfortunately, they can cause immune and allergic reactions. Synthetic biodegradable carriers based on polylactic and polyglycolic acids and their copolymers do not possess immunogenicity. However, when dissolved in the body, they oxidize the medium and damage adjoining tissues. These carriers can dissolve faster than new tissue is formed.
#2010-02-069

Quantum dots

High Technology Center of Research Institute of Applied Acoustic (Dubna) studies quantum dots – nanoparticles with unique optic properties.



Promising quantum dots' applications include:

- *Biotechnology and medicine*. Currently medical applications using quantum dots are limited. The limitation exists as nanoparticles effect on human health has not yet been sufficiently studied. However their application in serious diseases diagnostics looks very promising. An immuno fluorescent analysis method was developed using quantum dots. For cancer treatment in the so-called photodynamic therapy method, quantum dots are already used.
- *Optoelectronics and new-type LEDs*. Advantages of quantum points are used: high photostability, ability to ensure any color and any color temperature. LEDs can be used to make monitor displays that are very thin, flexible and with high picture contrast.
- *Power engineering*. Quantum dots can be used for improving solar cells' characteristics.

Two useful technologies have been developed by the **Laboratory of Nanocomposite Materials** using quantum dots:

- Polymer film with quantum dots that just needs to be stuck over a photovoltaic (PV) solar cell. The film absorbs only UV and transmits visible light. Many PV solar cells cannot do this. This

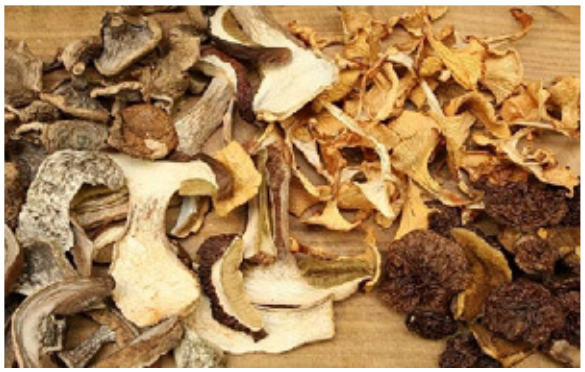
ability increases the PV solar cell efficiency by a few percent and significantly increases energy production.

- Solar radiation concentrators in thin polymer plates format. The development is based on inexpensive organic glass. Quantum dots or organic luminophores are placed inside it. The total plate area absorbs light and directs it to the ends. It is to the ends that solar cells are fixed. This technology sharply increases the incident radiation power per solar battery unit area. The development cost is low as solar cells are placed in plate ends minimizing their area.

#2010-02-070

Smell of dried mushrooms

A popular mushroom preservation method is drying. Drying significantly changes properties of any product. Along with moisture, mushrooms lose a part of their volatile organic agents. Drying also increases proteins, amino acids, sugars and organic acids concentration. If mushrooms are dried in the oven, not in the air, they react with sugars to form new organic compounds. In storage, their composition changes again. Some agents are oxidized or volatilized. Therefore, during storage, mushroom smell and taste change several times.



RAS Emanuel Institute of Biochemical Physics (Moscow) has identified fresh and boiled mushroom smells. They are currently studying dried mushrooms. The studies looked at boletus mushrooms picked in Central Russia, and oyster mushrooms grown industrially. Mushrooms were finely sliced and dried for 4 h at 60-70 °C. Then they were wrapped in tracing paper and stored at room temperature for two months. More than 200 volatile compounds were isolated from dried mushrooms, with over 50 of them identified.

Both mushroom types' smells are produced by compounds that belong to different organic agent classes. These are: unsaturated alcohols and ketones, heterocyclic compounds, and aromatic aldehydes. These compounds are formed by enzymatic degradation and oxidating the unsaturated fatty acids mushrooms are rich in. Another odorous compound source is the reaction between sugars and amino acids (Mayar reaction) during heating. Mushroom smells are determined by aliphatic alcohols and ketones with eight carbon atoms. Their content in boletus mushrooms is much higher than in oyster mushrooms. Dried boletus mushrooms contain 80 times less alcohol than canned ones and 20 times less than boiled ones. As a

result the raw mushroom smell intensity in dried samples is rather weak. The dried mushrooms' specific smell is formed by a complex furan, pyrazine, pyrrole and methional derivative mixture. Methional – a key mushroom smell component – is formed during methionine amino acid splitting. Its odor is very intense – people sense its smell even in concentrations about 0.2 ng/l. Methional content in dried mushrooms is 6-10 times higher than in freshly boiled ones. Two other important compounds – 2-furanthiol- -3 and 2-methyldihydrofuranthiol-3 – contribute a slight cooked meat flavor to the dried mushroom smell.

#2010-02-071