FOSTERING A NEW INDUSTRY

NANOMATERIALS

- RUSNANO. 2015
- HEALTH
- METALLURGY & INSTRUMENT MANUFACTURE
- ELECTRONICS
- NANOINDUSTRY INFRASTRUCTURE
The Rusnano portfolio is built on companies manufacturing a wide range of nanomaterials and related products for use across practically the entire economic spectrum, including construction, food, oil and gas, microelectronics, and defense.

Here are just a few highlights:

- High-purity quartz concentrates for the optical and electronics industries
- Nanofiltration systems
- Composite materials, including carbon nanotubes
- Packaging materials produced by Russia's largest manufacturers in the industry

**RUSNANO INVESTED**

about **26.7 billion rubles**

**PARTNERS**

- Sumitomo Corporation
- Morton
- NSG Group (Pilkington)
- Concern Energomera
- Uralplastic-N
- CapMan
  Russia

**PROJECTS** 20

**REGIONS** 24
The company manufactures polymer film and flexible packaging materials with nanocomposite additives (silicate nanoclay) that boost their barrier properties. Danaflex-NANO held 10% of the Russian food packaging market in 2014, with customers including Essen Production AG (mayonnaise), Miratorg Agribusiness Holding (meat and semi-finished products), Velikiye Luki Meat Processing Plant, Pestrechinka (poultry), Dymov Sausage Works, and agro-industrial holding Atyashevo (meat and semi-finished products).

**COMPETITIVE ADVANTAGES**

- **x2** Doubles the shelf life of food products
- **E** Reduces the amount of preservatives required in food
- **Low cost**
- **Can be used in microwave ovens**
- **Environmentally friendly (recyclable)**
Danaflex-NANO employs the latest technology and equipment.

The company’s packaging materials are used by major Russian food producers.

The company controls a 10% share of the Russian market.
Synthetic sapphire is the key input used to produce a number of crucially important micro- and optoelectronic components. Monocrystal manufactures sapphire substrates onto which various layers can be grafted as well as composite pastes with silver and aluminum used to metallize silicon solar cells. The company is the largest supplier of sapphire for the international LED (27% market share) and solar generation (15% in the aluminum paste for solar power segment) markets. Nearly all outputs (95%) are exported to a total of 25 countries, with the company’s main customers including manufacturers of solar panels, lighting systems, mobile devices (smartphones and tablets), telecommunications equipment, and LCD panels for monitors and televisions.
The world’s largest synthetic sapphire manufacturer

Production of monocrystalline sapphire (Kyropoulos method)

Monocrystalline products: sapphire wafers (right) and silver paste used to metallize the surface of solar cells (left)
DSK Grad, based in Moscow region, is a successful pilot project bringing high-tech solutions from a range of RUSNANO portfolio companies to bear on a single sector: mass-market housing construction. Galen, a beneficiary of RUSNANO investment, supplies fiberglass profiles for windows. The product is durable, cheaper, and more environmentally friendly than aluminum, and, unlike PVC profiles, can be used to make windows of any size. The composite material can withstand temperatures from -50° C to +90° C, does not absorb water, and is completely non-toxic.

Basalt reinforcements and dowels, also made by Galen, increase thermal efficiency for walls by 25% and, while comparable in strength to steel, are immune to corrosion and more durable. Galen products are currently being exported to countries with challenging climates, including the United Arab Emirates.

Energy-saving window glass with a nano-coating provided by SP Glass, another RUSNANO portfolio company, reduces heat loss in winter by up to 70% and prevents rooms from overheating during the summer.

A third RUSNANO investee, Akrilan, supplies DSK Grad with concrete plasticizers that increase structural strength of concrete by 10-15% and its elasticity by 15-20%. Akrilan also manufactures nano-dispersion paint, putties, and primers that are non-toxic and considerably more durable than other options.

DSK Grad is targeting revenues of 7.8 billion rubles in 2015.
The largest manufacturer of prefab construction units to enter the Russian market in the last 30 years, currently the biggest in the country, is [1]. Products manufactured by other RUSNANO companies – Galen (left) and SP Glass (right) – are used by DSK Grad.

A SUCCESSFUL pilot project applying the solutions offered by RUSNANO portfolio companies to the residential real estate segment.
Metaclay (Karachev, Bryansk region)
www.metaclay.ru

Metaclay’s main product is anti-corrosion coatings with a polymer composite base used to protect large-diameter oil and gas pipelines. The coatings push the service life of pipes to 60-80 years, increasing their durability and strength in extreme temperatures (-60° C to +80° C), reducing gas permeability, and protecting against solar radiation. Metaclay coatings will be employed to protect the new Power of Siberia gas pipeline being built to export Russian gas to Far Eastern export markets. The company also plans to certify its nano-coatings for use by Transneft, the Russian oil pipeline monopolist, and Rosneft, the leading Russian oil company. Technology advantages and streamlined costs have allowed Metaclay to win market share in Russia from foreign players (most notably from Borealis).

In addition to oil and gas, Metaclay products have broad application in the cable, packaging, and automotive industries, as well as in construction. Metaclay sales volumes in 2014 reached 20,000 tons, while revenue amounted to 2.2 billion rubles. The company’s target for 2015 is more than 50% of the Russian market for oil and gas pipe coatings. The company has created 210 jobs in its home town of Karachev (Bryansk region, south of Moscow).
METAQLAY’S TARGET FOR 2015

is 50% of the Russian market for anti-corrosion coatings in its segment
RM Nanotech boasts Russia's first and Europe's largest plant producing nanostructured membranes for water purification. Access to clean water remains a pressing social challenge in Russia and elsewhere. Until recently and despite growing demand for high-performance purification systems, 99% of the membrane modules used in Russia were imported. The launch of the RM Nanotech plant made Russia only the sixth country to have its own industrial manufacturer of nanofiltration membranes.

The company’s membrane systems and equipment are used in a variety of industries, with customers including engineering companies manufacturing water treatment systems for end users as well as companies in the chemical, oil and gas, and power engineering sectors. Yuzhuralzoloto, Russia's largest gold mining company with operations in the Urals, successfully introduced equipment used to treat mine water and built on membrane elements supplied by RM Nanotech. The nanotechnology company also won a tender to supply membrane elements to Nizhnekamsk Power Station in Tatarstan. Tatneft, a major Russian oil company also based in Tatarstan, now prefers Russian-made membrane elements to imports from Hydranautics, a US-based company.

### COMPETITIVE ADVANTAGES

- Product quality on par with top international competitors
- Import substitution
- Competitive price
- Excellent logistics
- Comprehensive technical support
Production lines at RM Nanotech, Europe’s largest plant manufacturing membrane fabric and filter modules.

Spiral-wound filtration elements made by RM Nanotech for ultra-filtration, nanofiltration, and reverse osmosis.

EUROPE’S BIGGEST plant producing nanostructured membranes.


Virial is the only full-cycle company in Russia manufacturing nanostructured ceramic and metal ceramic goods for use at high temperatures, under high pressure, and in corrosive environments. The company’s products have a number of advantages compared with traditional materials (metals and polymers), including strong resistance to wear, an ability to function across a broad range of temperatures, and chemical inertness. They include a cutting tool for use on strong, hard, and heat-resistant metal and composite materials, boosting both productivity and accuracy.

Using nanostructured materials to build industrial pumping equipment increases its service life and reliability by 20–30%. Company products are already used in the Russian defense industry to protect armored vehicles and personnel. Ceramic armor plating provides substantial ballistic protection and is being applied in the design of new and advanced weapon systems.
[1] Ceramic-matrix composites (ceramic reinforced with carbon fiber) are unique in that they combine the best of both ceramic and carbon fiber.


RUSSIA’S ONLY full-cycle plant manufacturing nanoceramics.
The single-walled carbon nanotubes manufactured by the company under the TUBALL trademark are universal nanomodifiers that improve the mechanical properties as well as the electrical and thermal conductivity of various materials (rubber, composites, polymers, etc.). OCSiAl outputs are uniquely designed (the concentration of single-walled carbon nanotubes in each product exceeds 70%) and uniquely priced (more than five times cheaper than foreign-made products of comparable quality). The technology developed by the company drives the world’s first example of cost-effective single-walled carbon nanotube production.

The OCSiAl pilot installation’s annual capacity, one ton of single-walled carbon nanotubes, puts it among the world’s largest, conveniently setting it up to serve a global market for carbon nanotubes that will expand to about 4,000 tons by 2020.
OCSiAl’s production site is one of the largest facilities manufacturing nanotubes in the world.

[1], [3] Pilot industrial facility “Graphetron 1.0” for synthesis of single-walled carbon nanotubes at OCSiAl’s R&D centre near Novosibirsk

[2] OCSiAl offers several versions of carbon nanotubes under the TUBALL trademark.
Prepreg-SKM manufactures modern polymer composite materials from glass- and carbon-fiber in addition to pre-impregnated fibers ("prepregs"). The materials are used in the aerospace industry to manufacture plane and helicopter airframes, wings, fairings, screws, tail assemblies, and cabin interiors.
The materials are also used in the space industry for rocket fins, housing, and various construction, transport, and launch canisters. Composite materials account for up to 50% of modern aircraft bodies, a number that will only increase for future generations.
Prepreg-SKM products are also used in shipbuilding: the Sredne-Nevsky Shipyards in St. Petersburg is now completing work on a passenger catamaran made entirely from composites that use Prepreg-SKM fabrics.

Composites are used in the construction industry to strengthen concrete structures: carbon-ribbon reinforcements can increase the load bearing capacity of residential and industrial buildings as well as bridges several times over.
Other promising applications for composite materials include manufacturing blades for wind turbines and renovating infrastructure and utility equipment.
Gazprom has asked Prepreg-SKM to assist in the manufacture of composite pipes for two experimental pipelines: a 90 km section in Yamalo-Nenets Autonomous District (northern Russia) and a 14 km reserve underwater crossing for the Yamburg-Tula-2 trunk gas pipeline (the River Ob in Khanty-Mansi Autonomous District, also in northern Russia).
Production of various types of carbon fabrics at the Prepreg-Dubna site

Sergei Sobyanin, mayor of Moscow; Dmitry Rogozin, Deputy Prime Minister; and Mikhail Abyzov, Minister for Open Government Affairs at the launch of Russia’s largest prepreg production line

USING COMPOSITE materials can reduce aircraft weight and fuel consumption by up to 20–30%

[1] Production of various types of carbon fabrics at the Prepreg-Dubna site

[2] Sergei Sobyanin, mayor of Moscow; Dmitry Rogozin, Deputy Prime Minister; and Mikhail Abyzov, Minister for Open Government Affairs at the launch of Russia’s largest prepreg production line

Russian Quartz operates a mining, treatment, and enrichment complex for deep-vein quartz at the Kyshtym deposit in the Urals. Concentrates are used as raw materials to produce high-purity quartz glass, which has applications in microelectronics, lighting manufacture, special-purpose optics, quartz ceramics, and many other high-tech fields. Russian Quartz launched the dry processing plant’s first phase in May 2012.

RUSNANO partially exited Russian Quartz’s share capital in the fall of 2013, selling a 16.13% stake to Japan’s Sumitomo Corporation, a strategic investor. Russian Quartz is now completing work on the second phase of its deep refining plant, one which will allow the company to triple its output of high-purity quartz concentrates and reach its targeted 15% share of the global market.
Russian Quartz produces RQ-2K and RQ-1K high-purity quartz concentrates used in solar energy and microelectronics.

Crushed quartz ore from the Kyshtym Mine.

The Russian Quartz laboratory uses the latest equipment to monitor product quality and nanoscale impurities.

At full capacity, the company expects to occupy 15% of the global market for high-purity quartz.
FOR NOTES