

# SK

# Energy

INNOVATIVE PROJECTS  
SKOLKOVO FOUNDATION

ENERGY EFFICIENT TECHNOLOGIES CLUSTER

# PROJECTS OF PARTICIPATING COMPANIES

## DIAKONT-INNOVATIONS LLC

# ELECTROMECHANICAL CONTROL SYSTEM FOR STEAM TURBINES

### COMPETITIVE ADVANTAGES /

Improved control quality ensures average production increase of up to 0,37%. Improved reliability of turbine control thanks to 3 times more precise valves positioning. Lower maintenance costs due to complete exclusion of hydraulic circuits.

### ESSENCE OF INNOVATION /

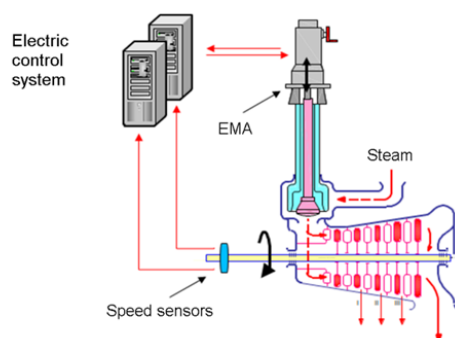
A highly dynamic electromechanical power actuator to operate the control valves. Complete exclusion of hydraulic actuators in the turbine control system. Actuator parameters: valve rod force 3 t, rod stroke 200 mm, rod full stroke time 0.5 s.

### RESULTS ACHIEVED /

Turbine mathematical model was created to model control efficiency. Technical requirements for automated turbine control system mockup developed. The system is under development.

### MARKET POTENTIAL /

The global market of steam turbines control systems amounts to RUB 5 billion. The Russian market - up to RUB 1 billion.



### THE TEAM /

VYACHESLAV NIKOLAEV, project leader. Author of 5 patented inventions.

The project team has experience implementing similar technical solutions in Russian power plants.

### CONTACTS /

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## PROTEN-VUT LLC

# TECHNOLOGY AND EQUIPMENT FOR PRODUCTION AND COMBUSTION OF THE COAL-WATER FUEL

### COMPETITIVE ADVANTAGES /

Combustion technology for low-grade coals with high humidity and ash content, including slurry coals and waste coals. Cost of 1 Gcal heat production is 70% lower than firing fuel oil. High level of fuel combustion (95-97%) to reduces environmental impact.

### ESSENCE OF INNOVATION /

Cavitation process for CWF processing applied. Physical and mathematical modeling performed to develop flamedroplet combustion of CWF under vortex conditions. Wear resistant nozzle developed.

### RESULTS ACHIEVED /

CWF production technology developed. CWF technical specifications approved. R&D completed, the pilot plant launched and tested. Technology is ready for commercialization.

### MARKET POTENTIAL /

Coal-fired power plants produce 40% of electricity. The share of low-grade coals in proven reserves amounts to about a half. Technology allows extensive use of brown coal in energy sector.



### THE TEAM /

SERGEI ALEKSEENKO,  
Doctor of sciences, Corresponding  
Member of RAS, specialist in the field of  
power engineering,  
320 publications;  
LEONID MALTSEV,  
Doctor of technical sciences, specialist  
in the field of hydrodynamics and coal  
power engineering,  
120 publications, 13 patents;  
IGOR KRAVCHENKO,  
more than 20-year experience in the field  
of thermal power engineering, 6 patents.

### CONTACTS /

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## AMALTEA-SERVIS LLC

### COAL-WATER FUEL

#### COMPETITIVE ADVANTAGES /

Energy consumption per tonne of CWF reduced by 33-75% compared to peers 10-12 kWh/t.

Low capex: RUB 0.6 m per t/h.

NOx emission from CWF combustion reduced by 30-50% as compared to coal and fuel oil.

A universal modular CWF processing and combustion unit.

#### MAIN POINTS OF INNOVATION /

A hydropercussion wet grinding unit combining several functions: feedstock batching; wet grinding and homogenization of dispersion; intermediate accumulation of dispersion. A unified assembly for CWF combustion applicable for a wide range of boilers.

#### RESULTS ACHIEVED /

The company has developed and tested a CWF processing unit and a CWF spraying nozzle.

Hot tests have been run in the EU; the tests have confirmed the reduction in NOx emissions and conformity of NOx, SOx, etc. emissions to EU standards. Several units have already been put into operation in Russia, CIS, EU, etc.

#### MARKET POTENTIAL /

By 2020, the Russian domestic market should reach a value of RUB 5.9bn.

The global market value is USD 6.9bn.



#### THE TEAM /

ANDREY MOROZOV,  
PhD in Engineering, General  
Director;

MAKSIM PROMTOV, Doctor of Science  
in Engineering, process engineering;

WALTER KLEIN, expert in international  
commercialization.

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## ENERGY TECHNOLOGIES LLC

# PLASMA-FUEL SYSTEMS FOR BURNING OF POWER GENERATING COAL AT THERMAL POWER PLANTS HAVING PERFORMANCE OF OVER 70 TONNES OF STEAM PER HOUR

### COMPETITIVE ADVANTAGES /

Cost saving for residual fuel oil (used for starting a fire), catch up & stabilization of flame. Sulphur & nitrogen oxides cut, elimination of vanadium pentoxide. Increasing combustion efficiency by 2-4%. Boiler efficient operation at low load & when using low-grade coal.

### ESSENCE OF INNOVATION /

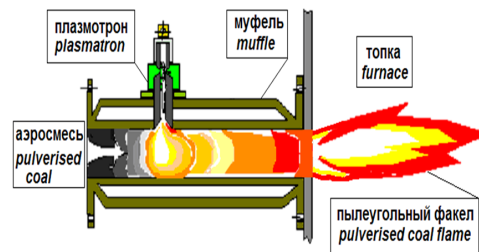
In contrast to the previous generation of plasma-fuel system and similar products, the new construction of the system and the plasma ignition method of pulverized coal fuel will provide use of the plasma-fuel system with lowenergy coal having a high ash percentage (up to 50%) and a high humidity level (up to 40%).

### RESULTS ACHIEVED /

Core components of the plasma-fuel system are developed: 200 kW plasma generator, power source, air & watersupply systems. Test protocols available: plasma-fuel system prototype was tested in 4 power generating units of the Gusinoozyorsk hydropower station (30,000 tonnes of residual oil was saved, the volume of emissions was cut by 13,000 tonnes per year).

### MARKET POTENTIAL /

30% of Russian thermoelectric plants run on coal with residual oil firing up and consume 15 million tonnes of residual oil per year (USD 3 billion a year). 4,000 plasma-fuel systems are required to equip the pulverized-coal-fired boilers of Russian thermoelectric plants. Worldwide market for these systems is USD 1 billion by the year 2020.



### THE TEAM /

VLADIMIR MESSERLE, Doctor of Engineering, laboratory chief in the Institute for Problems in Combustion (Kazakhstan);  
ALEXANDER USTIMENKO, doctor of Engineering, director of NTO Plasma Engineering (Kazakhstan);  
SERGEY SHTORK, Ph. D. in Physical and Mathematical Sciences, laboratory chief in the Institute of Thermophysics (Siberian branch of Russian Academy of Sciences);  
LUDMILA PEREPECHKO, specialist for commercialization & transfer of technologies in the Institute of Thermophysics (Siberian branch of Russian Academy of Sciences).

### CONTACTS /

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## EKOENERGIA LLC

# UNIVERSAL BURNER ARRANGEMENT FOR HIGHLY EFFICIENT COAL COMBUSTION IN MODERN THERMAL POWER PLANTS

### COMPETITIVE ADVANTAGES /

Reduction of NOx emission to comply with ecostandarts, slagging reduction. Exception of fuel oil for kindling and low-load combustions. Stable operation of the burners on brown and hard coals (volatile content over 30%).

### ESSENCE OF INNOVATION /

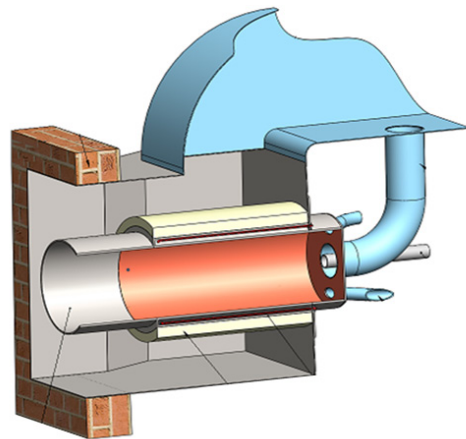
Ecological and energy efficient burners with pregasification of coal dust flow in preheat muffle section of the burners.

### RESULTS ACHIEVED /

Prototypes of the burners were tested at Krasnoyarsk, Tom-Usinsk and Belovsk coal power plants in 2001-2009. A commercial prototype was tested and certified in 2013.

### MARKET POTENTIAL /

By 2020, the domestic market demand in the Russian Federation will amount to 400 burners (RUB 1.5 billion). Potential consumers of the product: coal fuel thermal power plants.



### THE TEAM /

VITALY DUBROVSKY,  
Project Manager, D.Eng.Sc., professor of Siberian Federal University;  
MIKHAIL POTYLITSYN,  
Chief Designer, Head of SFU lab;  
MARINA ZUBOVA,  
Ph.D. in Economics, project feasibility study, Associate Professor of Economics of SFU.

### CONTACTS /

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## SMALL ENERGY LLC

# STEAM ENGINES FOR PRIVATE HOUSEHOLDS

### COMPETITIVE ADVANTAGES /

New heat and power generation units 3 to 5 times smaller than piston engines. Low and safe working temperature and pressure (140°C at 2-8 atm). Failsafe (1000-3000 rpm) rotation mechanism with low friction. Low production costs.

### ESSENCE OF INNOVATION /

Rotary Vane Engine with kinematics based on new non-circular gears. Three new kinematic schemes with non-circular cogwheels and coaxial layout developed.

### RESULTS ACHIEVED /

New Rotary Vane engine prototypes were created and tested. Integration codevelopment with German high-efficiency boilers producer is held.

### MARKET POTENTIAL /

Distributed energy generation, heat and power cogeneration for private households (25 kilowatt), small and medium-sized businesses (up to 250 kilowatt). Conversion of the stored energy of gas pressure.



### THE TEAM /

PAVEL BATASOV, ten-years-experienced engineer as the project leader; Mechanics professor as project scientific director for energy and thermal design; EU-based facility as power generation unit production partner.

### CONTACTS /

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## MULTI-JUNCTION SOLAR CELLS WITH VERTICALLY INTEGRATED QUANTUM DOTS

### COMPETITIVE ADVANTAGES /

Efficiency is enhanced by 4% over the counterparts presented on the market. Quantum dots do not result in the increase of the cost of the solar cell. The cost of solar energy for consumers is reduced due to enhanced efficiency and unchanged prime cost. The technology can be easily implemented into existing production lines.

### ESSENCE OF INNOVATION /

The use of high density quantum dots arrays with controllable absorption spectrum allows extending photosensitivity range of the middle (GaInAs) subcell. This solves the problem of photocurrent mismatch in multijunction solar cells.

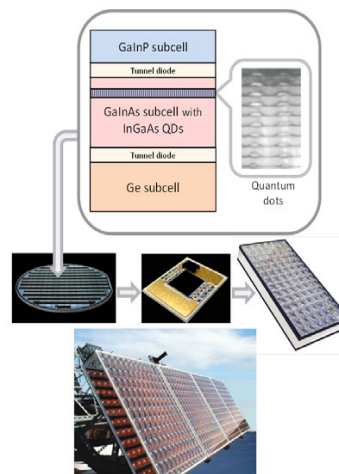
The technology of pseudomorphic epitaxial growth is absolutely suitable for industrial-scale production. Solar cells fabricated by using this technology show stable performance for a long period of operation.

### RESULTS ACHIEVED /

A prototype of single junction GaAs photoelectric convertor has been demonstrated. An increase in photocurrent is confirmed by R&D Center for Thin Film Technologies in Energy Sector Ioffe Physical and Technical Institute (Skolkovo resident).

### MARKET POTENTIAL /

As of 2012, the world CPV market was only 100MW. In 2015 the power capacity of CPV could be increased to 3GW in 2015 and to 10GW by 2020 showing an exponential growth.



### THE TEAM /

ALEXEY NADTOCHIY, CEO, co-founder;  
 MIKHAIL MAXIMOV, Chief Scientific Officer, has been the leader of a scientific group for 20 years, Hirsch index 38, co-founder;  
 SERGEY MINTAIROV, Chief Technology Officer, co-author of more than 40 scientific publications and 9 patents, co-founder.

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GRANTEE

**SOLEX-S LLC****THE NEW TECHNOLOGY FOR CREATING P-N JUNCTIONS IN Si SOLAR CELLS USING INTENSIVE LIGHT FLOW****COMPETITIVE ADVANTAGES /**

Almost triple increase in productivity of creating p-n junctions for solar cells.  
2.5-fold reduction of energy consumption  
1-2% increase in solar cells efficiency.  
The ability to produce bifacial solar cells at a price of unilateral elements.

**ESSENCE OF INNOVATION /**

Special compositions containing phosphorus or boron diffusant.  
An innovative method of applying compositions containing phosphorus or boron for the formation of diffusion source on textured silicon surface. Fast and controlled diffusion by intense light.

**RESULTS ACHIEVED /**

Samples of solar cells were manufactured and tested. A patent for a method of applying compositions containing phosphorus or boron diffusant was received.

**MARKET POTENTIAL /**

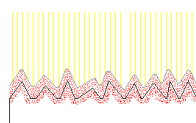
37 GW newly added PV capacity globally in 2013 pursuant to EPIA forecasts, the new capacity will range between 50 and 65 GW with an annual market volume of more than USD 50 billion in 2017.



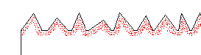
1. Silicon wafer with a texture



2. Applying film with diffusant



3. Diffusion of intensity light



4. Remove film with diffusant

**THE TEAM /**

ALEXANDER HUDYSH,  
CEO, the project leader, PhD. in Technical Sciences, obtained successful experience in organizing mass production of various types of solar cells and modules.

**CONTACTS /**

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## AEROGREEN CJSC

# WIND AND SOLAR POWER PLANT AEROGREEN

### COMPETITIVE ADVANTAGES/

High efficiency in hurricanes (above 30 m/s). Low noise level allows operation in residential areas. Lower generation cost per kWh (half as high as global peers). Solar elements can be used in the facility structure. Turbine does not require orientation on wind.

### MAIN POINTS OF INNOVATION /

Turbine-type wind-driven propeller installed in a covered noise-absorbing case instead of a conventional threeblade propeller.

### RESULTS ACHIEVED /

The company has manufactured a number of models and prototypes up to 1 metre in diameter, including a model that is currently undergoing field tests. A set of tests in a wind tunnel is underway to optimize the unit's structure. The company is preparing engineering design documents for a wind and solar power plant with a capacity of 65 MW.

### MARKET POTENTIAL /

The target market encompasses a wide range of customers from individuals to industrial businesses. The plant can be used in coastal areas as an offshore wind power plant.



### THE TEAM /

ANDREY SKOVITIN,  
General Director  
Aerogreen CJSC;  
EVGENIY TRAKHIMETS,  
Commercial Director  
Aerogreen CJSC;  
YURI KRIULIN,  
HeadDesigner  
Aerogreen CJSC

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## HYDROENERGOSPETSSTROY LLC

# OFFSHORE ENERGY COMPLEX WITH COASTAL PROTECTION

### COMPETITIVE ADVANTAGES /

An offshore energy complex based on wave energy dampers with coastal protection against storms. Reliable and efficient protection against all types of waves.

### MAIN POINTS OF INNOVATION /

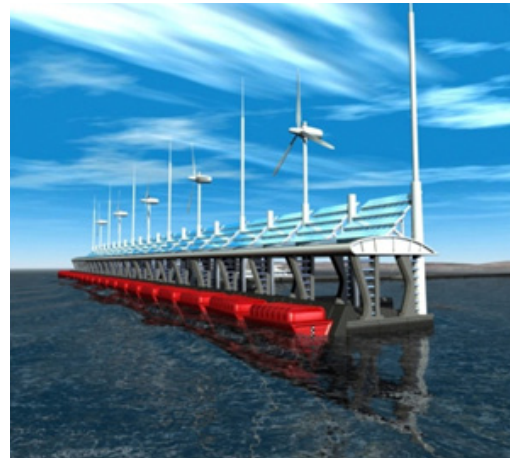
The wave energy damper is the core element of the energy transformation complex that exhibits maximum performance in any sea condition. In addition, the complex protects the coastal line against storms.

### RESULTS ACHIEVED /

The company has built and tested a pilot model (assembly) of the wave energy damper in a wave tank, and is currently building a commercial prototype of an energy complex with an installed capacity of 10kW.

### MARKET POTENTIAL /

The project product is aimed at providing power to business and recreational entities engaged in developing coastal and offshore areas. In 2012, the global market was estimated at USD 2bn, with a potential to grow to USD 45bn.



### THE TEAM /

VLADIMIR YEGURNOV, General Director,  
YEGOR BYKOV, Candidate of Sciences  
in Engineering, Science Director;  
EVGENIY VASICHEV, Electric Machine  
Designer, over 30 years of experience in  
companies engaged in power equipment  
development and operation.

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## RECYCLE CJSC

### BIODIESEL FUEL FROM BIOETHANOL

#### COMPETITIVE ADVANTAGES /

Low production cost and a wide resource base. Excludes the process of oil interesterification with methanol. 100% of biodiesel fuel can be applied at temperatures up to  $-50^{\circ}\text{C}$ , with 11 parameters improved of 22 EN14214 parameters. Bio diesel fuel can be used directly at the vegetable oil production site.

#### MAIN POINTS OF INNOVATION /

An innovative biodiesel fuel production technology excludes expensive and environmentally unfriendly intermediate stages to produce Permskoye bio-fuel with unique consumer properties.

#### RESULTS ACHIEVED /

The company has run pilot tests on key patented technologies and obtained multiple tonnes of the product sample. The first stage of ethanol waste recycling has been implemented on a commercial scale. The company has obtained intellectual property protection (a package of Russian and international patents for biodiesel fuel compounds).

#### MARKET POTENTIAL /

In 2009, the global biodiesel fuel market was around 15 billion liters (World Ethanol and Biofuels Report, EIA). The market growth rate is estimated to be 15% until 2020.



#### THE TEAM /

EVGENIY PANTELEYEV,  
General Director, Assistant Professor,  
Candidate of Sciences in Chemistry  
PAVEL PANTELEYEV,  
Deputy General Director for Commercial  
Issues.

#### CONTACTS /

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GRANTEE

**AT ENERGY LLC****HYDROGEN-AIR FUEL CELLS FOR STATIONARY AND MOBILE APPLICATIONS****COMPETITIVE ADVANTAGES /**

The target cost of the fuel cell (USD 2,500 per kW) is 30% lower than the lowest industry cost;

Fifty percent cheaper, 99.9% pure hydrogen is used as fuel;

Operating temperature range: from -40° to +40°;

Service hours: 40,000 hours.

**MAIN POINTS OF INNOVATION /**

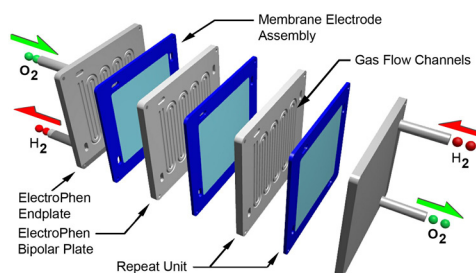
Humidity-independent proton exchange membranes (PEM) based on series-produced components capable of operating without wetting and at low negative temperatures. A cheaper catalyst; no need to use wetting and air cooling systems.

**RESULTS ACHIEVED /**

The grantee has validated and tested key technologies for making fuel cells with new properties and created a laboratory prototype of a membrane electrode assembly. The development of power unit core components with the stated parameters is underway.

**MARKET POTENTIAL /**

1-5 kW hydrogen power units for mobile and stationary applications. In 2012, the global market was valued at USD 1.2bn. The average market growth rates is 25% with an upside forecast of up to USD 2.3bn by 2016.

**THE TEAM /**

YURI DOBROVOLSKIY, R&D Head, Head of Laboratory of the Institute of Problems of Chemical Physics of the Russian Academy of Sciences;

SERGEY NEFEDKIN, Professor in the Moscow Power Engineering Institute;

DANIIL SHAPOSHNIKOV, General Director, 5 years of experience in managing high-tech start-ups.

**CONTACTS /**

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## ENERGO-EFFEKTIVNOST CJSC

### A SOC-BASED MINI POWER PLANT

#### COMPETITIVE ADVANTAGES/

Noiseless, environmentally-friendly and reliable independent power supply using natural gas, propane, butane, and biogas as fuel. Efficiency: up to 90% in cogeneration cycle.

Service hours: up to 50,000 hours. SOC (solid oxide cell) manufacturing cost: 50% lower than peer products.

#### MAIN POINTS OF INNOVATION/

Reliable and cost-efficient SOC manufacturing technology: cheap raw materials and inexpensive equipment, highly scalable.

The tubular structure makes SOC and the entire power plant simple and cheap.

#### RESULTS ACHIEVED /

The technology for manufacturing tubular SOC elements is ready for small-batch production. The advantages of the technology have been confirmed by the Stanford Research Institute (US).

#### MARKET POTENTIAL/

Mini power plants with a capacity from 1kW to 15kW for households, public utilities, agricultural and telecom companies. By 2017, the global market for fuel-cell based power plants should be valued at USD 2.6bn, with average market growth rates of up to 54.6%.



#### THE TEAM/

VLADIMIR SEVASTYANOV,  
Chief Developer, experience in implementing innovative industrial technologies in the nuclear industry;  
SERGEY SHUBENKOV,  
General Director, experience in commercializing new products.

#### CONTACTS /

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GRANTEE

**INNOVATION COMPANY MEVODENA LLC****MEMBRANES FOR PURE HYDROGEN PRODUCTION FROM HYDROCARBONS****COMPETITIVE ADVANTAGES /**

Composite membrane productivity: up to 90 litres of hydrogen per minute; 20 times higher than palladium alloy membranes; cost of a new membrane: USD 600-700, 90% lower than peers, due to the replacement of palladium alloys with Group 5 metals.

**MAIN POINTS OF INNOVATION /**

Hydrogen is transported via the crystalline lattices of Group 5 metals much faster than via the palladium lattice. The company has developed a technology to manufacture membranes from vanadium alloy and has found a way to combine composite membranes with engineering materials.

**RESULTS ACHIEVED /**

Vanadium membrane prototypes have been created and tested in laboratory conditions. Experiments have proved the high capacity of the membranes. The company has developed and patented a package of engineering solutions.

**MARKET POTENTIAL /**

The global hydrogen production market will grow from USD 87.5bn in 2011 to USD 118bn by 2016. Palladium alloy membranes, the most widespread in the market, are extremely expensive while not sufficiently effective.

**THE TEAM/**

ALEKSANDR LIVSHITS, Project Leader, professor in the Bonch-Bruевич Saint - Petersburg State University of Telecommunications;

BREDESEN RUNE, scientific advisor, DSc, Research Director of SINTEF, an independent Norwegian research organization.

A research team with a 10-year track record of research in Japan and France.

**CONTACTS /**

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## MEMBRAN-NC LLC

# REDUCING THE COST OF HYDROGEN SEPARATION MEMBRANES

### COMPETITIVE ADVANTAGES /

Reducing the cost of hydrogen separation membranes by approximately 33% (up to USD 5,000 per sq. m) by reducing palladium and pre-cursor consumption. Membranes of complex geometry. A highly productive technology at moderate temperatures.

### MAIN POINTS OF INNOVATION /

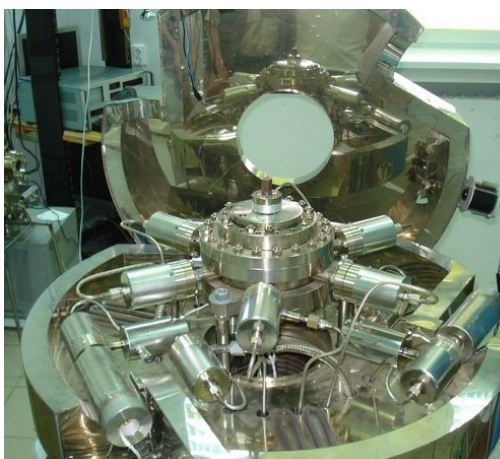
A modified metalorganic chemical vapor deposition (MOCVD) technology. Use of volatile compounds of palladium and dopant metals with organic precursors. Application of palladium containing layers on a surface of complex geometry.

### RESULTS ACHIEVED /

The company has developed a technology for synthesizing palladium precursors and dopant metals; produced pilot prototypes of palladium and palladium/copper containing coatings; started developing a commercial technology for applying palladium-containing layers on tubular materials.

### MARKET POTENTIAL /

The reduction of membrane makes it possible to reduce the production cost of super-pure hydrogen and expand its applications including in hydrogen energy. The super-pure hydrogen generator market is valued at USD 310-400 mln.



### THE TEAM /

**NATALYA MOROZOVA**, Doctor of Sciences in Chemistry, Project Leader, member of the Nikolaev Institute of Inorganic Chemistry (NIIC) of the Siberian Branch of the Russian Academy of Sciences;

**IGOR IGUMENOV**, Doctor of Sciences in Chemistry, Chief Developer, Head of the NIIC Laboratory, fellow member of the American Electrochemical Society;

**NIKOLAY GELFOND**, Doctor of Sciences in Chemistry, scientific advisor, Deputy Director of the NIIC.

### CONTACTS /

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## IQ SYSTEMS LLC

# ELECTRONIC VOLTAGE TRANSFORMERS WITH A CAPACITIVE DIVIDER

### COMPETITIVE ADVANTAGES /

Digital interface IEC 61850 for Smart Grid integration. Hazardous explosive materials excluded. Class 0.2 measurement accuracy. Operating temperature range: -60 to +60°C. Lower weight and size, installation and maintenance costs.

### ESSENCE OF INNOVATION /

Optical methods for measurements, transfer and processing of current parameters. Technology is based on a quartz crystal using the Pockels effect and inverse piezoelectric effect. Galvanic decoupler is used to increase safety.

### RESULTS ACHIEVED /

Three-phase electronic voltage transformer developed and tested. Measurement unit certification in progress.

### MARKET POTENTIAL /

Global market of voltage transformers in 2012 amounted USD 290 million, 2017 forecast USD 400 million a year. Russian market reached USD 80 million in 2012.



### THE TEAM /

OLEG RUDAKOV, project leader with the track record of R&D projects for Russian grids. The project team consists of scientists and engineers in the fields of optics, microsensors, radio physics.

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## EC-CONTINUUM CJSC

# DIGITAL DEVICE FOR METERING AND CONTROL OF THE ELECTRICITY QUALITY FOR TRANSFORMERS

### COMPETITIVE ADVANTAGES /

Low cost of one electricity metering point, less than RUB 20,000, is ensured through the modular design of the group metering device. Hybrid connection circuit for simultaneous use in analog and digital current and voltage transformers. Synchronization via PTP (IEEE 1588 v2) protocol, redundancy via PRP (IEC 62439-3) protocol.

### ESSENCE OF INNOVATION /

Group modular meter. Hybrid connection circuit for measurement instruments (digital and analog). Use of isochronous internal data bus for hard real-time data.

### RESULTS ACHIEVED /

Key components of the device developed. Intellectual property package completed.

### MARKET POTENTIAL /

Global market in 2018 - USD 318 million. Potential consumers in Russia: Rosseti, Federal Grid Company of Unified Energy System, Enel, Rosatom, Rushydro, E.ON, Russian Railways, Gazprom etc.



### THE TEAM /

SERGEY PEREGUDOV,  
Project Manager, implemented a number of projects for Federal Grid Company of Unified Energy System;  
ALEXANDER IVANOV,  
Chief Designer for the device hardware;  
ANDREY VOLKONSKIY,  
Software development leader.

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www.ec-continuum.ru

## CURRENT LIMITED LLC

# CONTACTLESS SWITCHES AND CURRENT LIMITERS FOR SMART GRID

### COMPETITIVE ADVANTAGES /

Significantly faster than traditional inertia switchers. Cost similar to inertia switches and much lower than superconducting current limiters. Non mechanical contacts to reduce heating losses, prevent unsafe voltaic arc or bounce.

### ESSENCE OF INNOVATION /

Nanostructured 1 micron thick carbon film on quartz substrate developed. Exceeding the critical current causes a transition from the metallic state to the insulator during 0.1 ms.

### RESULTS ACHIEVED /

Laboratory test sample of contactless switch with critical current of 1A was developed. 2 patents received.

### MARKET POTENTIAL /

Current global market of limiters and switches is estimated at USD 75 billion. New current limiters to replace unsafe inertia switches and extremely expensive superconducting current limiters.

	Inertia switches	Siper-conductor switches	New contactles switch
Price per unit, USD	5 - 75	1000+	10 - 100
Critical current	63 A	1000 A	10 - 1000 A
Switching time	0.1 – 2 sec	milisec	100 microsec
Operating temperature	<50C	< -70C	<650C
Arc	yes	no	no
Bounce	yes	no	no
Size (assembled)	3x4 cm <sup>2</sup>	50x20 cm <sup>2</sup>	3x4 cm <sup>2</sup>

### THE TEAM /

SERGEY LEBEDEV,  
 Founder and Chief Researcher, PhD in Physics. Has over 20 years of physics research experience;  
 VICTOR YANTS,  
 CTO, technologies and electrics expert.

### CONTACTS /

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## COMPOSITE ELECTRO LLC

# INCREASED EFFICIENCY CONDUCTOR WITH A NANOCOMPOSITE CORE

### COMPETITIVE ADVANTAGES /

Conductor section has a 20% larger area, heating allowance up to 210°C and 28% lower resistance, which doubles capacity of power transmission line compared to traditional wires. Number of poles reduced by 10% which results in power transmission line cost being comparable with traditional lines.

### ESSENCE OF INNOVATION /

Wire steel core replaced with a high strength nanomodified basalt or glass fiber composite core. Cheaper raw materials (basalt and glass fiber) for core production instead of expensive carbon fiber. New aluminum conduction layer for increased conductivity.

### RESULTS ACHIEVED /

New composite core lab prototypes are ready and tested in laboratory. Composite core conductor application feasibility study carried out.

### MARKET POTENTIAL /

Russian wire market amounted to USD 400 million in 2012, global market reached USD 10,8 billion. Growth forecast for the global market – up to USD 14 billion to 2020. The reconstruction of power lines aimed at increasing capacity does not require replacement of poles.



### THE TEAM /

**EVGENY NIKOLAEV**, CEO. Successful experience in launching Russian products in foreign markets;  
**VALERY NIKOLAEV**, R&D Manager, D.Eng.Sc., Basalt FRP developer, owner of over 20 patents, composite core pultrusion line developer.

### CONTACTS /

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## ELECTROCOMPOSITE LLC

# BARE ELECTRICAL CONDUCTOR WITH FLEXIBLE COMPOSITE MULTICORE

### COMPETITIVE ADVANTAGES /

Up to double increase in the conductor carrying capacity. Core breaking strength is twice higher, weight is 20-25% lower than that of steel core conductors. Construction costs of a line with a decreased number of poles is the same as that of a line with a traditional conductor. New conductor is twice or thrice cheaper than analogs.

### ESSENCE OF INNOVATION /

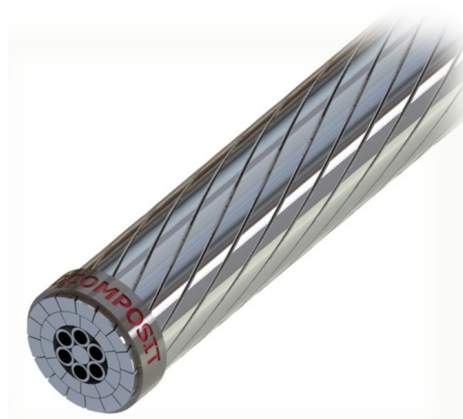
A flexible bare conductor environmentally sealed multi-fiber composite core was developed. Production process of highly productive multicore with metal sheath developed.

### RESULTS ACHIEVED /

Laboratory-scale processing line for threads production developed. 350 meters of the conductor produced and tested. A pilot-scale production facility is planned.

### MARKET POTENTIAL /

Bare conductor market in Russia is over 100,000 tons, RUB 12 billion. Global market – over USD 10 billion.



### THE TEAM /

DMITRY SILCHENKOV,  
project executive, experienced in  
conductor industry;  
SERGEY GRISHIN,  
chief technical officer, research engineer  
in Materials Science;  
OLEG LITVINENKO,  
business development director, 10 years  
of sales experience In UnComtech (one of  
the major wire suppliers).

### CONTACTS /

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## CONDUCTOR NANOTECHNOLOGIES LLC

# DEVELOPMENT OF TECHNOLOGY FOR PRODUCTION OF NANOSTRUCTURED ALUMINUM CONDUCTORS WITH IMPROVED PERFORMANCE

### COMPETITIVE ADVANTAGES /

Nanostructured aluminium alloy conductors produced using severe plastic deformation (SPD) with improved strength and electrical conductivity allow increasing the efficiency of wires due to enhanced strength, increased electrical conductivity and thermal stability.

### ESSENCE OF INNOVATION /

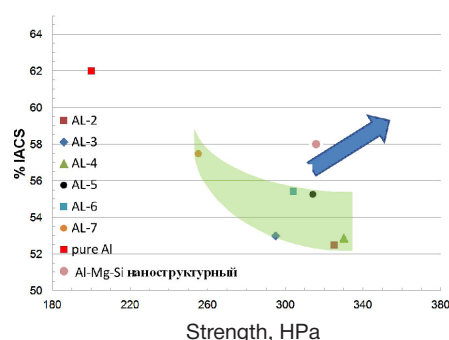
Grain refinement down to 300nm using SPD methods in aluminium alloys allows to significantly increase both their strength and electrical conductivity, which, in its turn, allows to create effective conductors for grids based on them.

### RESULTS ACHIEVED /

Severe plastic deformation (SPD) methods were used to produce pilot models of nanostructured Al-Mg-Si alloys with improved strength (350MPa) and electrical conductivity (58% IACS).

### MARKET POTENTIAL /

Aluminium wire production in Russia amounts to 200K tons per annum (USD 600 million). Potential market of nanostructured aluminium in Russia - up to USD 30 million per annum. Global market of aluminium rod / wire amounts to 7 million tons per annum (USD 20 billion). Potential global market of nanostructured aluminium - up to USD 1 billion per annum.



### THE TEAM /

**RUSLAN VALIEV**,  
Dr.Sc. in Physics and Mathematics, professor, Director of FPM Research Institute; Hirsch index 74;  
**GEORGIY RAAB**,  
Dr.Sc., Deputy Director in SPD technology; Hirsch index 18;  
**MAXIM MURASHKIN**,  
PhD, leading expert for development of nanostructured aluminium alloys; Hirsch index 11; **EVGENIY ANTIPOV**,  
leading expert for chemical and phase composition of materials, professor of Chemical faculty of Moscow State University, associate member of the Russian Academy of Science; Hirsch index 29.

### CONTACTS /

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## AC AND PP LLC

# HIGH-TORQUE ENERGY EFFICIENT ASYNCHRONOUS MOTORS

### COMPETITIVE ADVANTAGES /

Motor starter torque and minimal operating torque increased by 30%. Average motor load ramped up, bringing energy losses down by 15% to 30%. Complies with IE2 Motor Efficiency Standard.

### ESSENCE OF INNOVATION /

Series of electromagnetic fields computer simulations and the subsequent prototyping delivered the invention of new electric motor windings. Further advanced electromagnetic design is held for pending IE3 standard from 2015.

### RESULTS ACHIEVED /

Developed, patented and set up production of 0.18 to 11 kW motors with new winding. Motors comply with high efficiency IE2 Standard (obligatory in Europe from 2011 IEC 60034-30), comply with Russian 51689 assembly specifications.

### MARKET POTENTIAL /

Electric motors market in Russia was USD 216 million in 2011. Russian end Western European market to reach USD 650 million in 2016. Electric transport, pumps, ventilation, industrial conveyors and machines. Low-cost engine upgrade available.



### THE TEAM /

Dmitry Dyunov, project leader, successfully developed and implemented more than ten innovations for energy efficient machinery. Electrical engineers with academic background and experienced computer aided engineering professionals core the project team completed with University of Electronic Technology postdocs.

### CONTACTS /

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## 4D ENERGETICS RUS LLC

# SAFE, RELIABLE, LOW-COST ENERGY STORAGE FOR GRIDS

### COMPETITIVE ADVANTAGES /

Cost of accumulation cycle decreased to 0,01 USD per kilowatt. Total system capital cost of \$200/kW is 4-5 times lower than for Lilon systems. Significant (up to 20000 cycles) life span 4-5 times longer than Lilon batteries. High roundtrip efficiency up to 85% for 4 to 36 cycles per day.

### ESSENCE OF INNOVATION /

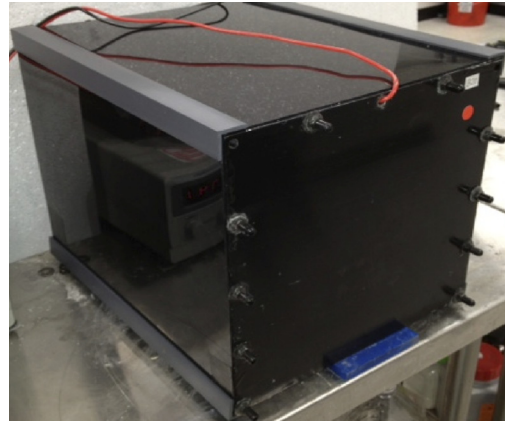
The absence of chemical reactions at the electrodes enables rapid charge and increases life span. Activated carbon electrodes are cheap and easy in production, which is critical for the cost of mass production.

### RESULTS ACHIEVED /

A laboratory 48V battery prototype developed and tested to perform efficiency up to 82%. Basic technology and materials patent protection built. Electrodes production and battery design know-how developed.

### MARKET POTENTIAL /

Off-grid energy storage. De-link supply and demand to reduce peak infrastructure. Enhance profitability & adoption of renewable generation. Storage market will reach USD 77 billion in 2020.



### THE TEAM /

**IOURI BALACHOV**, project leader and developer. Physicist from MEPHI. Worked at Stanford Research Institute in 1998-2009. Led to success several projects for DoE, EPRI, DARPA;  
**IOURI VOLFKOVICH**, leading electrolyte developer. Doctor of chemistry in Institute of Physical chemistry and Electrochemistry RAS. The project team is accompanied with Bright Capital competence.

### CONTACTS /

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 www.4denergetics.com

GRANTEE

**FM LAB LLC**

## LITHIUM-AIR BATTERIES WITH LARGE ENERGY CAPACITY WILL PROVIDE UP TO A FIVE-FOLD INCREASE OPERATING TIME FOR PORTABLE DEVICES AND ELECTRICAL VEHICLES

### COMPETITIVE ADVANTAGES /

With its specific capacity of 1000 Watthours per kilogram lithium-air batteries outperform current lithium-ion batteries by at least five times. Specific energy capacity is comparable to that of petroleum.

### ESSENCE OF INNOVATION /

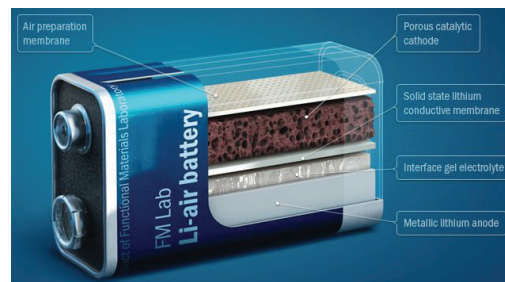
Rechargeable chemical power source. Atmospheric oxygen is used for the reduction reaction.

### RESULTS ACHIEVED /

Battery cell prototypes are already developed and tested. Patent protection strategy is under implementation. Joint Development Agreement with international market leader is in progress. Two patents pending.

### MARKET POTENTIAL /

Global battery market is expected to grow and reach USD 30 billion by 2020. Electrical vehicles market is the most promising segment for batteries. Such application will increase vehicle mileage up to 700 km.



### THE TEAM /

DENIS SHABRATOV,  
CEO, founder of a number of hi-tech companies;  
DANIIL ITKIS,  
PhD Physics and Mathematics, head designer, laureate of the RAS prize and winner of the Moscow State University award for young scientists. Graduates of the Faculty of Materials Science at Lomonosov Moscow State University have joined the team.

### CONTACTS /

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GRANTEE

## SCIENTIFIC CENTER AIT LLC

# SAFE LITHIUM-ION BATTERIES FOR STATIONARY AND MOBILE APPLICATIONS

### COMPETITIVE ADVANTAGES /

Complies with IEC62660 - 2 safety standards. More than 2,000 cycles in real life. Batteries are fire and explosionproof in high currents. Specific energy is not less than 120 Wh/kg. Operating temperature ranges from -300 C to +700 C.

### ESSENCE OF INNOVATION /

The cathodic materials are based on modified lithium phosphate vanadate with high energy density, capacity and resource.

Increased cycle stability at cycling at a wide temperature range by using anode materials based on lithium titanate.

### RESULTS ACHIEVED /

Samples of active cathode and anode materials of lithium phosphate vanadate and lithium titanate were designed and tested for service life duration. Patent protection of active materials was conducted.

### MARKET POTENTIAL /

By 2020, global battery market is expected to grow 3 times (up to USD 30 billion).

Advanced applications: back-up power sources in networks, hybrid and electric cars.



### THE TEAM /

VYACHESLAV VOLYNSKIY,  
D.Eng.Sc., over 20 year experience  
in the development and implementation  
of energy storage devices in production;  
OLEG VOLKOV,

over 30 year experience in the  
development of energy storage devices,  
previously worked at Ener1, Nanoener;  
KONSTANTIN KILIVNIK,

Ph.D., 20-years of experience in the  
development of chemical cells, previously  
worked at Ener1, Nanoener.

### CONTACTS /

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GRANTEE

**LITION LLC****NEXT-GENERATION LITHIUM-METAL-POLYMER BATTERY****COMPETITIVE ADVANTAGES /**

Triple increase of battery energy density (up to 500 Wh/kg) to extend portable device operating time. The planned battery cost of kWh is approx. 300-400 USD that is twice less than lithium-ion batteries.

**ESSENCE OF INNOVATION /**

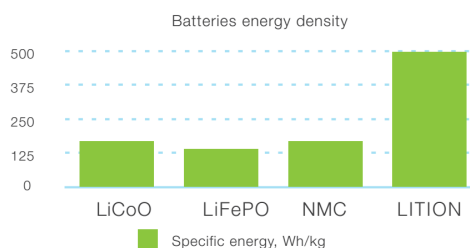
Nanostructured vanadium oxide cathode material with 500 mAh/g specific energy (compared to 150 mAh/g for cobalt oxide material). Lithium metal negative electrode with 3,000 mAh/g specific capacity (compared to 300mAh/g for widely used materials).

**RESULTS ACHIEVED /**

New lithium-metal-polymer cathode material prototypes successfully tested by 100 recharge cycles. Battery lab prototypes with 380 Wh/kg energy density developed.

**MARKET POTENTIAL /**

Portable energy storage market to reach USD 30 billion in 2014. Batteries for laptops and smartphones is the most dynamic sector of the energy storage market.

**THE TEAM /**

**NIKITA RATS**, has more than 9 years of experience in technology start-up companies;  
**ALEXANDER SKUNDIN**, CTO, Doctor of Chemistry, Frumkin Institute of Physical Chemistry and Electrochemistry at RAS, more than 20 years of experience in electrochemistry, more than 500 papers and 5 patents, h-index 12;  
**VICTOR KRIVCHENKO**, PhD, Senior engineer.

**CONTACTS /**

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GRANTEE

**ELEMENT 22 LLC****CERAMIC CAPACITOR FOR POWER ELECTRONICS WITH EXTREME SPECIFIC CAPACITY****COMPETITIVE ADVANTAGES /**

Significant specific capacity increase with low production costs.  
 Power storage density is two times higher than analogue – more than 2 J/ccm for 100-1000 volts applications.  
 Further size and volume miniaturization.  
 Technology fit into existing ceramic capacitor production technology

**ESSENCE OF INNOVATION /**

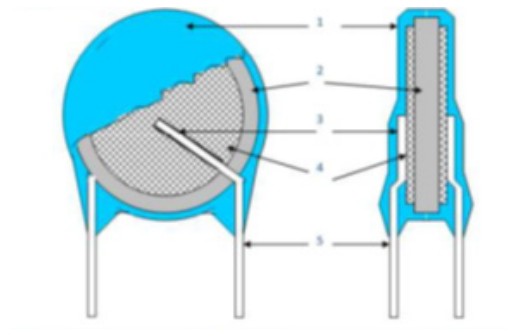
Capacity improvement on account of ferroelectric ceramics modification by unique low cost method.  
 Technology application for contemporary dielectric materials allows 8 times energy density improvement.

**RESULTS ACHIEVED /**

First modified ceramic tests carried out by international industry leaders and results confirmed characteristics.  
 Industrial technology for ultra-capacitors is under development.

**MARKET POTENTIAL /**

Condensers for power electronics market reached \$1.4B in 2013.  
 2020 forecast to exceed \$3.6B.  
 Industrial technology has license potential on US and Southeast Asia.

**THE TEAM /**

**IGOR SCHERBAKOV**,  
 Project manager, experienced in capacitor technology commercialization from 2005;  
**SERGEY RYAZANTSEV**,  
 Technical director, more than 30 years experience in technology development.  
 Project team has experience in capacitor technology development and commercialization in Japan, Italy, UK.

**CONTACTS /**

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 info@element22.org

## BARGAN TECHNOLOGY LLC

# CERAMIC DOUBLE-LAYER CAPACITORS WITH HIGH SPECIFIC ENERGY

### COMPETITIVE ADVANTAGES /

Minimization of capacitor size with high capacitance (52 J/cm<sup>3</sup>) and increased operating current (20 V). Operating temperature span: -50°C to +50°C. Low level of dielectric losses and absence of spurious noise with high operating frequency (up to 20 MHz).

### ESSENCE OF INNOVATION /

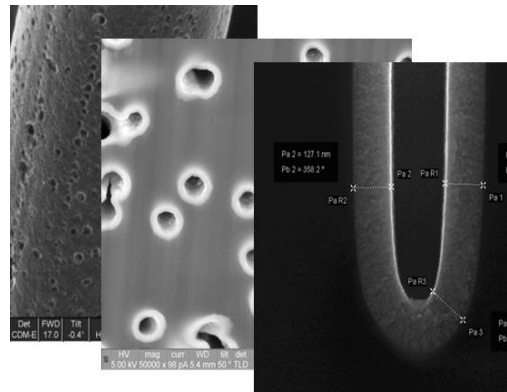
The double-layer capacitor 'metalinsulator- metal'. ALD technology applied to achieve thickness of dozens of nanometers, low-cost sealing and packaging technologies.

### RESULTS ACHIEVED /

New porous carbon material researched and developed. Dielectric conformal layer deposition method developed.

### MARKET POTENTIAL /

Global ceramic capacitors market reached USD 10 billion in 2012 and is expected to double by 2020. New product can replace aluminum and tantalum capacitors.



### THE TEAM /

ANATOLY MALYGIN,  
head of the project development team,  
chairman of several surface chemistry  
and nanotechnology sections at the  
Russian Academy of Science;  
VASILY BARGAN,  
project leader with 10 years experience in  
development of innovative projects and  
venture investment.

### CONTACTS /

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## KONGRAN LLC

# NEW GENERATION SUPERCAPACITORS

### COMPETITIVE ADVANTAGES /

Energy density of up to 50-100 Wh/kg (Li-ion level) along with much higher power density of 5-10 kW/kg. Supercapacitor based on inexpensive derivatives of graphene and non-toxic electrolyte will still be cost-effective five folding parameters.

### ESSENCE OF INNOVATION /

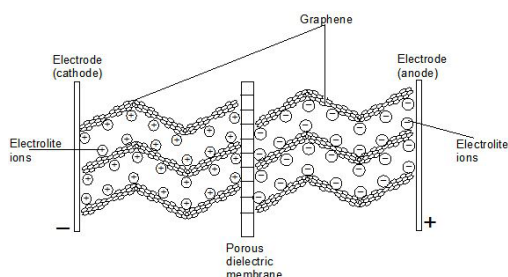
The electrode made of new graphenebased composite materials has a high redox potential and porosity providing high energy and power density. Electrolyte is natural hydrolysis-resistant lithium salt of natural acids, nonflammable and non-toxic.

### RESULTS ACHIEVED /

Supercapacitor 4.5V current cell lab prototype with energy density of 46 Wh/kg (per electrode material mass) developed and tested.

### MARKET POTENTIAL /

Supercapacitor global market will exceed USD 1 billion in 2014 and reach USD 3,5 billion up to 2020  
All energy storage market will reach USD 77 billion up to 2020.



### THE TEAM /

**SIMON CHERVONOBRODOV**, project leader, owner of carbon production CarbonLite;  
**VLADIMIR GOLDBERG**, Doctor of Chemistry, Professor at Institute of Biochemical Physics RAS.  
Project team from Institute of Biochemical Physics, Institute of Chemical Physics, Institute of Physical Chemistry and Electrochemistry RAS and Moscow State University.

### CONTACTS /

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GRANTEE

ELTON, CJSC

## ELECTRIC TRANSPORT ENERGY STORAGE SYSTEMS AND ENGINE SURE START MODULES FOR TRUCKS AND HEAVY MACHINERY

### COMPETITIVE ADVANTAGES /

Storage system service life is up to 20 years with operating mode of 1000 charge-discharge cycles per day. Energy storage cost is 1.5 times lower in comparison with similar solutions. Dependable service at temperatures from -50 to +65 C. Nontoxic materials used; explosive safety.

### ESSENCE OF INNOVATION /

Asymmetric electrochemical capacitors based on nickel-carbonic systems with inexpensive & safe aqueous electrolyte are developed. Technology for mass production of capacitor components is put into practice for high-performance equipment.

### RESULTS ACHIEVED /

Sample systems are developed & tested. Feasibility study for use of accumulators for electric & hybrid vehicles is developed. Existing pilot production. Applications for 2 Russian and 1 International patent are filed.

### MARKET POTENTIAL /

Energy regeneration for electric & hybrid vehicles, start/stop systems. Supercapacitor market will exceed the sum of 1 billion USD in 2014 and reach 3.5 billion USD by 2020.



### THE TEAM /

MIKHAIL RODIONOV, general director, development manager. The team consists of several Ph.D.'s in Physical and Mathematical Sciences & Chemical Sciences, scientists of P.N. Lebedev Physical Institute of the Russian Academy of Sciences & Moscow State University.

The team has proven experience in the capacitor market since 1993.

"Elton" capacitors are present in the North America market since 1998.

### CONTACTS /

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GRANTEE

**TEEMP LLC**

## SUPERCAPACITORS FOR ELECTRIC VEHICLES WITH 3-4 TIMES INCREASED CAPACITY AT COMPARABLE PRICES

### COMPETITIVE ADVANTAGES /

Specific capacity of 25 Wh/kg is 3-4 times higher than market analogs at comparable energy storage price of less than USD 1 per watt-hour. Cost of energy storage for impulse capacitors (5 kW/kg power) is less than USD 20 per watt.

### ESSENCE OF INNOVATION /

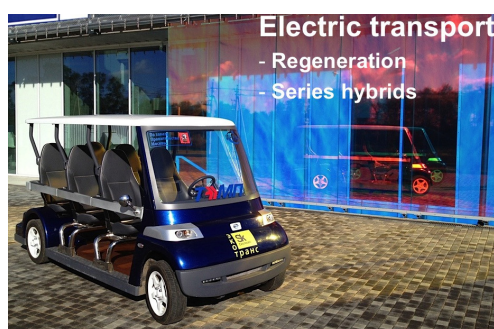
Super-capacitors with acid electrolyte. Composite hydrocarbon nanomaterial electrodes, for effective double layer formation.

### RESULTS ACHIEVED /

Power and impulse super-capacitor cells have been developed. Cell parameters are confirmed by CNAM electro chemical's lab in Paris, France. One Russian patent pending, seven international patents pending.

### MARKET POTENTIAL /

Recuperators and impulse current sources for electric vehicles. Grid energy storage, renewable energy sources integration. Average super-capacitors annual market growth is 30%.



### THE TEAM /

**ANATOLY DOLGOLAPTEV**,  
CEO and scientific director of the project;  
**VYACHESLAV FILIN**,  
Sc.Dr. Tech., head designer for the project, former director of development of complex space systems;  
**OLEG DASHKO**,  
PhD. Tech., dep. CEO, owns 50 copyright certificates and patents.

### CONTACTS /

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GRANTEE

**INNOVATION DEVELOPMENT CENTER STM LLC****SHUNTING LOCOMOTIVE WITH HYBRID DIESEL-ELECTRIC POWER UNIT AND ASYNCHRONOUS DRIVE REDUCES FUEL CONSUMPTION BY 30%****COMPETITIVE ADVANTAGES /**

Locomotive fuel consumption reduced by 30%. Greenhouse gas emission reduced by 55%. Life-cycle cost reduced by 31%. Up to one hour of noiseless operation inside buildings.

**ESSENCE OF INNOVATION /**

Efficient diesel-electric drive with microprocessor control. More than 20 innovative technical solutions. Track profile prediction with GPS and GLONASS.

**RESULTS ACHIEVED /**

Hybrid locomotive technical specifications and a Declaration of Intention to purchase locomotives signed by «Russian Railways» JSC. The prototype is currently undergoing certification acceptance tests. Four patents issued, 4 Russian and international patents pending.

**MARKET POTENTIAL /**

10,000 shunting locomotives in «Russian Railways» JSC's fleet. 7,000-8,000 locomotives at industrial enterprises. Up to 70% of shunting locomotives are worn-out. By 2015, the global market will require over 120 shunting locomotives with the total cost of 240 million Euros.

**THE TEAM /**

ANTON ZUBIKHIN,  
D. Tech., Director of the Innovation Development Center STM Center;  
YEVGENY FYODOROV,  
chief designer, 17 years of experience in vehicle manufacturing;  
ALEKSEI TARASOV,  
dep. head developer, engineer with 10 years of experience.  
There are over 90 engineers and developers at the company with experience in vehicle manufacturing.

**CONTACTS /**

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GRANTEE

## ENSOL TECHNOLOGIES LLC.

# ACTIVE BALANCING SYSTEM FOR IMPROVEMENT OF INDUSTRIAL LITHIUM BATTERIES CAPACITY AND LIFE CYCLE

### COMPETITIVE ADVANTAGES /

Lithium battery capacity improvement by 20%. Battery lifecycle improvement up to 50%. High balancing currents are sufficient for industrial capacities (up to 100 kWh). System cost lower than analogue by 50%.

### ESSENCE OF INNOVATION /

System solution for lithium battery operating process optimization through the use of active balancing principle. Construction advantages achieved by revolutionary circuitry architecture.

### RESULTS ACHIEVED /

BMS system prototype developed. Successfully tested in cooperation with international engineering company AVL GmbH. Initial implementation of technology in international logistic companies (RUR 3 mln. contract).

### MARKET POTENTIAL /

Applications: warehouse appliance, industrial UPS. Russian market more than RUR 20 billion. World market more than USD 10 billion. Potential Russian traction batteries market share 20% in 3 years.



### THE TEAM /

TIMOUR RAKHIMI, project manager, international experience in implementation of innovative technology solutions;  
 KONSTANTIN KLEIN, commercial director, international experience in innovation commercialization;  
 ANDREY IVANOV, Chief developer, more than 20 years experience in battery management systems development  
 ANDREY ZABOLOTNIY, Senior developer, more than 15 years experience in battery management software development.

### CONTACTS /

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## AEROZASCHITA, LLC

# IMPROVING BUILDING VENTILATION EFFICIENCY THROUGH AIR PURIFICATION BY USING AN INNOVATIVE CARBON DIOXIDE REMOVAL TECHNOLOGY

### COMPETITIVE ADVANTAGES /

Energy consumption is 10 times less. Owning cost is 1.5 times lower; no UV lamps (therefore, there is no need to wipe & check them, no need to keep record of working hours and dispose the lamps). Complex air cleaning & disinfection, no resistant microorganisms.

### ESSENCE OF INNOVATION /

Innovative technology provides concurrent high-precision filtration, microorganism inactivation (incl. mold fungi) on filters, removal of odour & hazardous substances in gaseous phase. The operating principle is based upon reduction of supply air volume (heated or cooled), incl. ventilation of special facilities (hospitals, clean rooms).

### RESULTS ACHIEVED /

Previous generation technology without carbon dioxide removal is already implemented into the great number of Moscow & Novosibirsk healthcare facilities. Next stage of research and development activities is completed; tests & trial operation are carried out; preparation for the production is being performed now.

### MARKET POTENTIAL /

According to prudent estimates, Russia market volume for energy-saving ventilation equipment is over RUB 15 billion.



### THE TEAM /

DMITRY TRUBITSYN,  
project leader;  
ILYA POLYAKOV,  
general director of Aerozaschita, CJSC;  
ALEXEY OKUNEV,  
Ph. D. in Physical and Mathematical  
Sciences, academic adviser;  
SERGEY EREMENKO,  
Ph. D. in Physical and Mathematical  
Sciences, developer.

### CONTACTS /

Novosibirsk  
Anton Zhuchkov

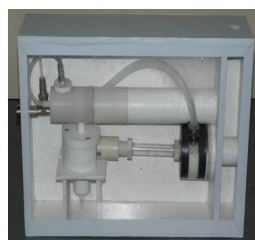
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## VKM GROUP CJSC

# MULTI-PURPOSE EVAPORATIVE VORTEX AIR CONDITIONER

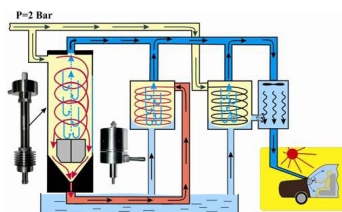
### COMPETITIVE ADVANTAGES /

High efficiency cooling. Low power consumption of the conditioning process. Air conditioning, humidification, air ionization functions performed by one unit. Simple structure, small size, low cost.



### ESSENCE OF INNOVATION /

The use of evaporation and thermal energy separation in devices combined into a single unit and provide cooling, humidity, ionization and air recirculation.



### RESULTS ACHIEVED /

Completed the first stage of research and development. The patents are received: No. 2296273, No. 2187383, No. 2213016, No. 2233711, No. 2234986. Complete examination of the patentability of the international patenting. A prototype of the air conditioner on the basis of the VAZ 21214 «demo car».

### THE TEAM /

NIKOLAY KURNOSOV,  
Science & Technology Director, Professor.

### MARKET POTENTIAL /

According to preliminary estimates, annual market of the Russian Federation of compact cooling and air cleaning systems amounts up to USD 1 billion. With the 0.5% planned occupation of the market and the 1.5% royalty during the first year the company will be able to get the revenue of RUB 240 million.

### CONTACTS /

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## NEW COMPOSITE TECHNOLOGIES – RESEARCH AND DEVELOPMENT LLC

### CREATION OF THE NEW GENERATION VERSATILE PIPELINE SYSTEMS BASED ON COMPOSITES

#### COMPETITIVE ADVANTAGES /

Absolute corrosive resistance. Low pressure resistance and abrasability, low deposition on the inner walls. Transportation of corroding & abrasive mediums in all climate conditions. High strength and light weight: 4-5 times lighter than polyethylene, steel and castiron pipes. Pressure up to 70 atm. and above. Service life is 50 years and above.



#### ESSENCE OF INNOVATION /

Double-layered composite material was created for the first time, which consists of chemically sewed polyethylene and fibreglass using plasma-chemical polymer pre-processing. Also, for the first time, this combined material was used in production of combined pressure pipes.

#### RESULTS ACHIEVED /

Prototype testing of combined pressure pipes is performed. For the project subject, 7 patents were received in total: 3 patents for inventions and 4 patents for useful models. Application for the PCT procedure was filed.

#### MARKET POTENTIAL /

Polymer pipes – CAGR 6.2 %, USD 68 billion in 2017.  
Fibreglass pipes – CAGR > 10 %, USD 16.4 billion in 2017.  
Steel pipes: CAGR < 4%.  
Potential for this product is up to 10 % of total market volume for pipes with diameter over 400 mm.

#### THE TEAM /

VLADIMIR VINARSKY,  
General Director;  
ALEXANDER DRACHEV,  
Deputy General Director for science and technologies;  
OLEG NIKITIN,  
Chief Structural Engineer;  
ANATOLY KUROCHKIN.

#### CONTACTS /

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## ENERGOTEKHNIKA LLC

# ENERGY EFFICIENT HEAT EXCHANGERS BASED ON THE SPIN FLOW TECHNOLOGY

### COMPETITIVE ADVANTAGES /

Heat transfer coefficient is up to 2.5 times higher than of plane smooth shelland- tube heat exchanger, low hydraulic resistance. Light, compact design, resistant to heat and water. Capital and maintenance costs are 15-30% lower.

### ESSENCE OF INNOVATION /

Cellular heat exchangers based on heat exchange tubes with spin flow. Efficiency is improved by swirling of the liquid flow. Cell structure of the beam without the tube board. Intertubular space is «sandwiched» between hollow spiral fins.

### RESULTS ACHIEVED /

Pilot heat exchangers for heating system in the Chelyabinsk Region were installed and are being successfully operated. An agreement for installation of pilot heat exchangers at the sites of «MOEK» JSC, «Samaraneftegaz» JSC, «KES» CJSC.

### MARKET POTENTIAL /

Annually, the Russian market of heat exchangers for heating and hot water supply demonstrates 15% + growth. This being the case, the market potential of heat exchange tubes with a swirling flow in the housing services and utilities sector only amounts to over RUB 1 billion.



### THE TEAM /

The project team comprises specialists in the field of electrical engineering and computer modeling, experienced electrical engineers and young professionals - graduates of the Moscow Institute of Electronic Engineering.

### CONTACTS /

Moscow, Zelenograd  
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## GAZPROEKT-DIAGNOSTIKA LLC

# REMOTE-CONTROLLED DIAGNOSTIC SYSTEM FOR IN-LINE INSPECTION OF HEATING NETWORKS

### COMPETITIVE ADVANTAGES /

The method is 7.5 times cheaper compared to diagnostics on an open line. Allows identifying potentially dangerous sites with a critical wall thickness. Provides an opportunity for certification of pipelines and follow-up monitoring.

### ESSENCE OF INNOVATION /

A fundamentally new method for non-destructive testing – thickness measurement on the basis of the dynamic skin layer effect. Electromagneticacoustic method, adapted to the specific conditions of heat networks.

### RESULTS ACHIEVED /

The chassis and the electromagnetic control module improved; the module is being finalized based on the effect of the skin layer, pilot testing completed.

### MARKET POTENTIAL /

Target geographic markets – Russia, USA / Canada, Scandinavia.  
120,000 - 160,000 km of Russian heating systems are over 10 years old and are in need of diagnostics requiring RUB 3 trillion.



### THE TEAM /

VIKTOR DEGTYAREV, chief scientist, holds doctoral position at Saint Petersburg State University.

### CONTACTS /

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## ADVANCED MAGNETIC TECHNOLOGIES AND CONSULTING LLC

### THE GAS VALVE WITH AN ULTRA-LOW-POWER CONSUMPTION FOR GAS SUPPLY SYSTEMS, ADAPTIVE SYSTEMS TO PREVENT ACCIDENTS

#### COMPETITIVE ADVANTAGES /

Ultra-low power consumption, current consumption of less than 50 mA at a voltage of 3.6 V. The presented product consumes up to 130,000 times less electricity than the existing market counterparts.

#### ESSENCE OF INNOVATION /

The use of high-energy NdFeB permanent magnet and original circuit solutions electronics ensure ultra-low power consumption. Now adaptive systems for disaster prevention can be created.

#### RESULTS ACHIEVED /

Established a pilot production, obtained all the necessary approvals for the Russian market.

#### MARKET POTENTIAL /

According to estimates of JSC Gazprom, annual market volume for these breakers in Russia amounts to USD 200 million, the volume of the European market – up to USD 1 000 million.



#### THE TEAM /

ALEXANDER TISHIN, head of a team of developers, Professor of Lomonosov Moscow State University, Russia.

#### CONTACTS /

Troitsk, Moscow Region  
Yuri Spichkin

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## SAVANT RESEARCH AND DEVELOPMENT LLC

# TECHNOLOGICAL COMPLEX OF PREVENTIVE TREATMENT OF HEATING SYSTEMS, INCLUDING THE INNOVATIVE REAGENT AND TECHNOLOGY FOR ITS USE BY INTRODUCING REAGENT MICRODOSES INTO THE COOLANT

### COMPETITIVE ADVANTAGES /

Hydraulic resistance of the pipe reduced by 30%, the cost of the coolant reduced by 30%. Cost saving on the current and capital repairs, saving effect of flushing for 3 heating seasons.



### ESSENCE OF INNOVATION /

Reagent based on film-forming high molecular amines for removing and preventing formation of deposits on the internal surfaces of the heating tubes.

### THE TEAM /

ALEXANDER PECHKIN,  
executive director,  
Project head, experience in energy and utilities sectors.

### RESULTS ACHIEVED /

Further development of the reagent, pilot implementation, formation of an integrated package of services.

### MARKET POTENTIAL /

The potential of the Russian market is estimated at about RUB 24 billion a year. The market is not completely developed and has a high growth potential (up to 30% a year).

### CONTACTS /

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## MAYAK

# THERMAL EXPANDING POLYMER SLEEVE MADE FOR PIPE SYSTEMS REPAIRING

### COMPETITIVE ADVANTAGES /

Affordable method of trenchless rehabilitation of pipelines for various purposes.  
Up to 50 years guarantee.

### ESSENCE OF INNOVATION /

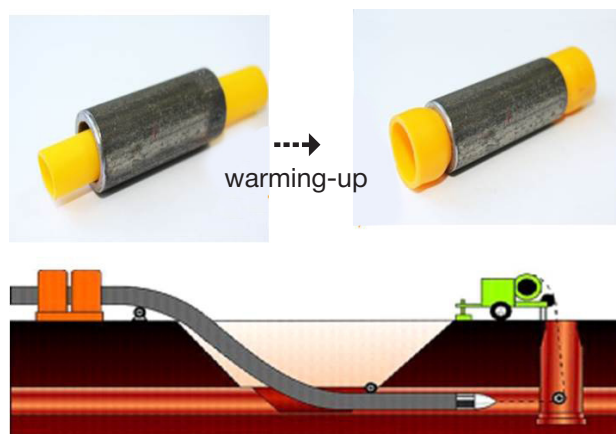
The polymer which allows for 200% expansion by molecular relaxation when re-heated to the plasticization temperature.  
The composite can withstand high mechanical loads and temperatures and has a high chemical resistance.

### RESULTS ACHIEVED /

Laboratory samples of thermo-sleeve with parameters have been developed: diameter – 18 mm, length L – 100 mm, expansion ratio – 1,3.  
Research and Technological Development is launched to increase the product characteristics.

### MARKET POTENTIAL /

According to experts, the current need for urgent pipelines repair in the housing services and utilities sector in Russia amounts to over 65%. In Saint Petersburg, RUB 82,5 billion has been allocated for repair of thermal facilities and hot water pipes in 2013.



### THE TEAM /

ALEXANDER SHESTAKOV,  
chief developer, has experience in implementing innovative industrial technologies, author of the project's patent.

### CONTACTS /

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Chelyabinsk Region  
Dmitry Alyavdin

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## LAB-N-FAB LLC

# REFLECTIVE OPTICAL FILTERS FOR DISPLAYS REDUCING POWER CONSUMPTION

### COMPETITIVE ADVANTAGES /

Low-cost solutions, reduction of power consumption by almost 50%, easy commissioning of technology.

### ESSENCE OF INNOVATION /

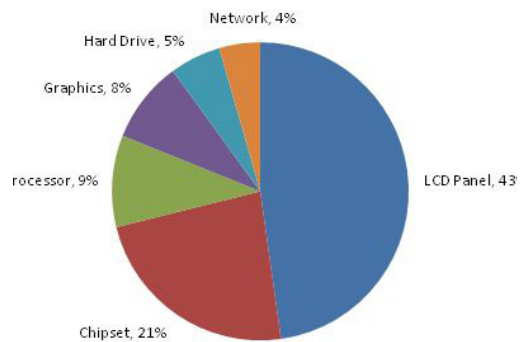
The reflective optical filter is applied to the existing absorptive color filter – it is possible to achieve 80-85% transmission of a particular color, reflecting up to 80-90% of other colors. The filter does not affect the screen resolution, color reproduction is improved.

### RESULTS ACHIEVED /

Development and testing of a sample that confirmed the presence of an optical effect. A computer model of the filter is created.

### MARKET POTENTIAL /

The global market of screen filters is estimated in USD 10 billion. The projected share of the company for the first year of project implementation is 1%, which will be USD 100 million.



### THE TEAM /

SERGEY NIKOLENKO, general director, project executive, has a decade of experience in innovation development.

### CONTACTS /

Moscow  
Sergey Nikolenko

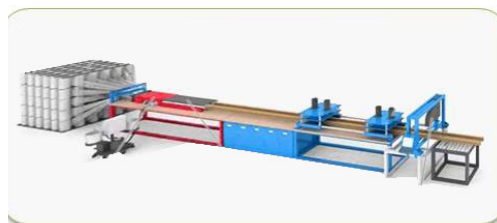
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## PULTRUSION TECHNOLOGIES CJSC

# ULTRACOMPOSITE SHEET PILES MANUFACTURED BY HIGH PRESSURE INJECTION PULTRUSION METHOD BASED ON NANOMODIFIED COMPOSITE-POLYURETHANE MATRICES

### COMPETITIVE ADVANTAGES /

Lightweight and easy to install, extremely durable (at least 50 years!). High mechanical properties and durability, environmental safety, aesthetic appearance, resistance to corrosion and aggressive media.



### ESSENCE OF INNOVATION /

New environmentally friendly method of production of composite products increases the strength of manufactured products by more than 200%.



### RESULTS ACHIEVED /

All necessary tests and certification of the products performed. Products installed at a number of sites. Positive feedback from the customers received. The products are budgeted for a number of largescale state projects. State expert review conducted.

**THE TEAM /**  
ANATOLIY ZHIRIKOV,  
General Director.

### MARKET POTENTIAL /

Market size in Russia  
until RUB 2020 - 200 billion.

### CONTACTS /

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## TRUBMETPROM RESEARCH & DEVELOPMENT CENTER

# DEVELOPMENT OF A FUNDAMENTALLY NEW SCV TECHNOLOGY AND MODULAR UNITS FOR TREATMENT OF ROLLED METAL PRODUCT SURFACES

### COMPETITIVE ADVANTAGES /

Reduction of energy consumption, improvement of energy efficiency and environmental safety of pipe and rolled metal product surface treatment processes in metallurgy, nuclear energy, machine-building for high quality surface treatment.

### ESSENCE OF INNOVATION /

Innovative stream cavitation vortex (SCV) treatment methods with the use of modular SCV cells eliminating any energy-intensive processes, improving energy efficiency and performance of treatment processes, reducing resource consumption and production costs, improving surface treatment quality.

### RESULTS ACHIEVED /

6 patents, 10 commercial introductions.

### MARKET POTENTIAL /

The forecast growth of metalworking market in the period from 2009 to 2015 is 6% per year. By 2015, the market size will exceed USD 52 billion.

According to experts, about 10% of the metalworking market are accounted for by finish treatment. It is this niche that the products of Trubmetprom NTP LLC account for.



### THE TEAM /

**SERGEY SIROTKIN**,  
member of International Academy  
of Scientific Discovery and Invention  
Authors, 72 patents, 144 publications;  
**TATYANA VORONINA**,  
principal executive in charge, honorary  
metallurgist, 37 patents. 94 publications;  
**NIKITA KUZNETSOV**,  
2 patents, 2 publications;  
**VIKTOR KOVALEV**,  
318 patents, 256 publications, professor.

### CONTACTS /

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## ULTRASOUND SYSTEMS

# RESOURCE-SAVING ULTRASOUND UNITS FOR ULTRAHIGH CLEANING OF MATERIALS AND MACHINERY

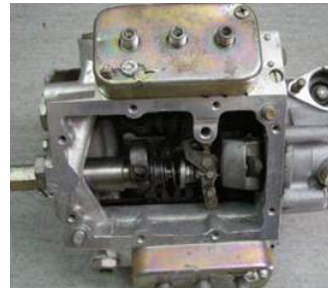
### COMPETITIVE ADVANTAGES /

Cleaning through the use of powerful ultrasound complexes, with the cleaning quality no lower than 99.99%. Substitution of chemical technologies with ultrasound ones will allow reducing significantly the costs and improve the cleaning quality, reduce costs for environmental safety.



### ESSENCE OF INNOVATION /

Cleaning of complex configuration parts weighing from a few grams up to 2 tons to remove severe operation and process contaminants by ultrasound treatment in water solutions of environmentally friendly detergents. Reduction of raw material losses, improved cleaning quality and increased cleaning rate, reduction of maintenance and environmental protection costs.



### RESULTS ACHIEVED /

The equipment is in place and running in Gazpromneft, Rosneft, Lukoil, Uralvagonzavod, Russian Railways, Severrechflot, Total and Schlumberger plants.

### THE TEAM /

YAKOV VELTS,  
PhD in Science, Director, Research advisor;  
ILYA VELTS,  
PhD in Economics, Director for Development;  
NATALYA VELTS,  
Chief Process Engineer.

### MARKET POTENTIAL /

According to Ultrasonic Cleaning Equipment Manufacturing in the US (Industry Market Research Report, IBISWorld, 2012), the global ultrasound cleaning market amounts to USD 990 million. Average annual rate of growth: 6%.

### CONTACTS /

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## NEOTEKH CJSC

# ENERGY-EFFICIENT TECHNOLOGY FOR PRODUCTION OF SPRINGS WITH ENHANCED PERFORMANCE CHARACTERISTICS USING THE METHOD OF ANISOTROPIC ORIENTATION OF NANOSTRUCTURE IN METAL

### COMPETITIVE ADVANTAGES /

Applying the methods of heat treatment & plastic deformation belonging to metal thermomechanical treatment processes. Quality improvement for elastic elements, reduction of production energy costs, reduction of owning cost.

### ESSENCE OF INNOVATION /

Application of a single high-speed induction heating technological cycle, plastic deformation by spiral crimping, spring arrangement, tempering in environment that has a controlled cooldown rate and high blazing-off.



### RESULTS ACHIEVED /

Hardenable laboratory module for — 10 mm work pieces was designed & produced. Successful results for metallographic & mechanical tests were obtained.

### MARKET POTENTIAL /

Russia & CIS market volume for springs is RUB 20 billion. Project purposes – 5% of the market share.

IP sales market volume is RUB 400 million. Project purposes in the market share – 25%.

### THE TEAM /

DMITRY TARASOV,  
general director, project manager;  
VALERY EVSYAGIN,  
technical director, deputy development director;  
VYACHESLAV DEMENTYEV,  
project research supervisor.

### CONTACTS /

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## UNIMET LLC

# RESOURCE-SAVING ULTRASOUND UNITS FOR ULTRAHIGH CLEANING OF MATERIALS AND MACHINERY

### COMPETITIVE ADVANTAGES /

Complete solution for equalization of chemical composition and refining the grain structure during the casting process of a large-sized aluminium ingot.

### ESSENCE OF INNOVATION /

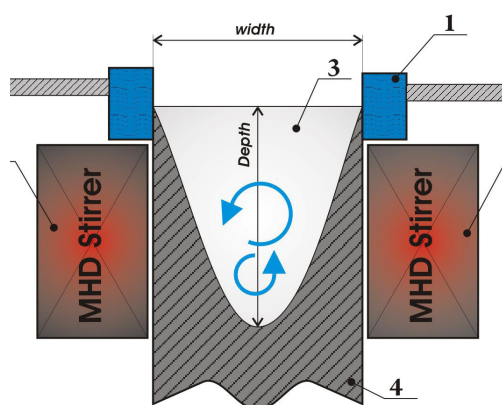
Using multiple frequency travelling field to have effect on the liquid heart of a aluminium ingot during casting for improvement of the crystallization conditions and achievement of the ingot's homogeneous fine crystal structure and, consequently, obtaining a high-quality product with well-defined chemical & technical parameters.

### RESULTS ACHIEVED /

Russia patent was received, application for the PCT patent was filed. Scientific research plan is developed. Laboratory specimen of the device are produced. An agreement for implementation of the device in Europe was signed.

### MARKET POTENTIAL /

According to the Harbour Aluminium report, OEM MHD mixing worldwide market estimates at 2 billion USD, where 240 million accounts for the liquid heart agitators, which consists over 300 casting units worldwide.



### THE TEAM /

EVGENIY PANTELEEV,  
General Director, associated professor,  
Ph.D. in Chemical Sciences;  
PAVEL PANTELEEV,  
Deputy General Director for commercial  
affairs.

### CONTACTS /

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## MAROMA TECHNOLOGIES LLC

# CERMETS FOR BALL GATES OF HIGH TEMPERATURE VALVES WITH INCREASED LIFE TIME AND NOMINAL BORE UP TO DN150

### COMPETITIVE ADVANTAGES /

High wear resistance, even with large abrasive particles present. High resistance to thermal and mechanical shock. No laminations on the surface due to integrity of the product material.

### ESSENCE OF INNOVATION /

Manufacturing of complex configuration products, particularly, a bulb stopper entirely made of cermet in one operation. Ball gate is manufactured entirely from cermet by infiltration of porous carbide semi-product with nickel alloys and steels.

### RESULTS ACHIEVED /

Experimental technology of manufacturing ball gates DN50 from cermet with up to 100mm bulb stopper and a valve trial tested. Valves DN50 passed laboratory tests and prepared for factory tests. International application filed.

### MARKET POTENTIAL /

According to forecasts, the global market volume will reach USD 75 billion. New ball valves may take up to 5% of the market (USD 3.7 billion).



### THE TEAM /

RUSTAM MAMLEYEV,  
CEO, Ph.D, experience in development of cermet for tool and structural applications;  
NAIL ZARIPOV,  
head of R&D, Ph.D in Physics and Mathematics, author of more than 100 scientific publications;  
ZEMFIRA SHTOYE,  
(Germany) - head of R&D has developed the Noblexierung method.

### CONTACTS /

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GRANTEE

**SMS TENZOTERM RUS LLC****EFFICIENT THERMOELECTRIC GENERATORS  
AND TENZO-SENSORS BASED  
ON SAMARIUM SULFIDE SEMICONDUCTOR****COMPETITIVE ADVANTAGES /**

Electricity generation efficiency is 2-3 times higher than that of existing TEG. No significant temperature gradient is required to achieve the thermoelectric effect. The efficiency of TEG is 30-40%. Operating temperature range from 50 to 500°C.

**ESSENCE OF INNOVATION /**

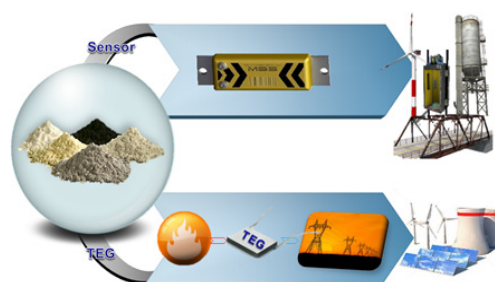
A new material based on samarium sulfide (SmS) was synthesised. The high efficiency of the material is associated with the new physical phenomenon - thermovoltaics, discovered and investigated by the authors of the project.

**RESULTS ACHIEVED /**

The samples of SmS semiconductor material were tested at the University of Dortmund, confirming the voltage generation at permanent temperature 50°C and the output power up to 1.8 W/g (solutions currently available in the market generate only 0.55 W/g).

**MARKET POTENTIAL /**

The global market amounted to USD 5 billion in 2012. Should the current dynamics persist, the market will increase up to USD 8 billion by 2017.

**THE TEAM /**

ANDREY MOLODYH,  
CEO;  
ANATOLY MOLODYH,  
the project leader;  
DR. VLADIMIR KAMINSKY,  
scientific project director, has 30 years of  
experience in the research of  
samariumsulfide,  
is one of the discoverers of the  
termovoltaics effect.

**CONTACTS /**

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## FEMTOINTEH LLC

# THERMOELECTRIC GENERATOR MATERIALS BASED ON CLATHRATE COMPOSITES, CONTAINING NO TELLURIUM OR LEAD

### COMPETITIVE ADVANTAGES /

Cost reduction by almost 30%.  
Efficiency of not less than 12%.  
Environmentally friendly.  
Usefull life is over 20 years.  
It does not contain any potentially hazardous substances and precious metals in its composition.

### ESSENCE OF INNOVATION /

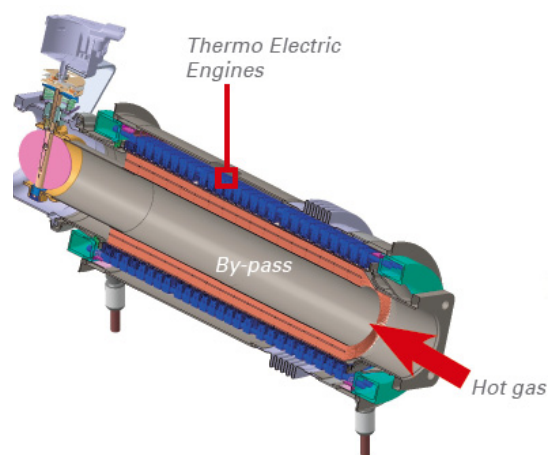
Creating new composite materials based on clathrates. Improvement of thermoelectric properties by optimizing the control methods of electronic and phonon transport.

### RESULTS ACHIEVED /

Synthesis methods have been developed along with the interrelation between «composition - structure - thermoelectric factor» for no tellurium and precious metals of «cationic clathrates» compounds.  
Samples with  $ZT = 0.6$  at a temperature of 700 Kelvin were obtained.

### MARKET POTENTIAL /

The global market is estimated to USD 5 billion; by 2017, it is expected to increase to USD8 billion. With increasing material efficiency, the market size estimation can exceed USD16 billion.



### THE TEAM /

The project team includes managers with experience in promoting start-up projects in the field of thermoelectricity. The project team include well-known developers in thermoelectricity from «Giredmet» JSC and «NPP» Kvant» JSC.

### CONTACTS /

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## METEMP LLC

# THERMOELECTRIC MATERIALS FOR UTILIZING THERMAL ENERGY IN A WIDE TEMPERATURE RANGE

### COMPETITIVE ADVANTAGES /

Decrease in price of the thermoelectric material as compared to the competing technologies and increase the working temperature range.

### ESSENCE OF INNOVATION /

The applied technology for production of three-dimensional nanostructured materials allows significant reduction of the thermal conductivity. The project is focused on medium and high temperature applications.

### RESULTS ACHIEVED /

Nanostructured three-dimensional materials were produced. Unique unit for measuring of electrophysical properties of thermoelectric materials up to 900°C created.

### MARKET POTENTIAL /

The volume of market of exhaust energy utilization devices (Energy harvesting) is estimated USD 4.4 billion.



### THE TEAM /

ANDREY VORONIN,  
CEO;  
VLADIMIR KHOVAYLO,  
Dr.Sc in Physics and Mathematics,  
Director of Research;  
ANDREY USENKO,  
Chief Process Engineer.

### CONTACTS /

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GRANTEE

**QMODULE LAB LLC****MINIATURE MECHANICAL ENERGY  
CONVERTER FOR ELECTRONIC DEVICES  
WITHOUT BATTERIES****COMPETITIVE ADVANTAGES /**

Energy for one cycle at the output is 1.25 mW/sec at the converter production cost of circa \$1.

Cost of the converter is 10 times lower than that of analogs.

**ESSENCE OF INNOVATION /**

Energy conversion of mechanical pressure into electricity for power supply of small electronic devices.

Increase the power output of the charge generators of piezoelectric elements, triboelements and radioisotopes.

**RESULTS ACHIEVED /**

The product prototype is ready.

**MARKET POTENTIAL /**

The product can be used to create Smart House systems. The annual market for wireless sensors, switches and remote controls may reach USD 1 billion by 2019.

**THE TEAM /**

MARTYN NUNUPAROV,  
PhD in Physical and Mathematical  
Sciences, CEO. More than 20 years of  
experience in research..

**CONTACTS /**

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GRANTEE

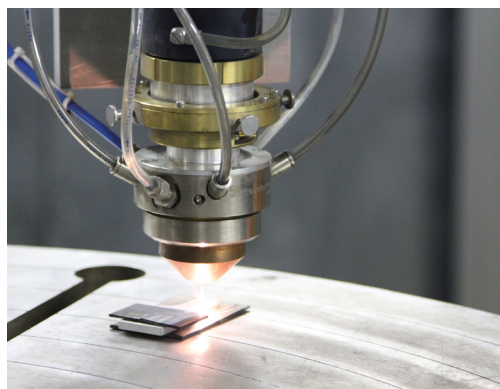
**TSPC LLC**

## FUNCTIONAL AND PROTECTIVE COATINGS

### COMPETITIVE ADVANTAGES /

High corrosion resistance. High mechanical properties and adhesion (over 65 mPa).

High durability under high temperatures. Application of materials that meet the environmental and operating conditions: the properties of the compound can be varied by selecting powder compositions as required (corrosion-resistant, cavitation-resistant, etc.).



### ESSENCE OF INNOVATION /

Thermal spray coating technology, specifically flame spraying (FS), highvelocity oxy-fuel (HVOF) and air plasma spraying (APS), and laser processing technology are used to apply composite functional coatings for multifunctional protection.

### THE TEAM /

LEV BALDAEV,  
Dr. Sc., CEO;  
SVETLANA MUKHAMETOVA,  
deputy CEO.

### RESULTS ACHIEVED /

57 patents, including international ones. Every year at least 6 new patents are registered.

The developed technology and equipment have been introduced at the largest power utilities, gas and oil production facilities.

### MARKET POTENTIAL /

Thermal spray coatings are demanded in the mining and processing of oil and gas, energy, aviation and other industries for strengthening and restoration of details. The Russian market volume is UDS 2 billion per annum.

### CONTACTS /

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## ROMET LLC

# A MULTILAYER METAL MATERIAL WITH HIGH CORROSION RESISTANCE

### COMPETITIVE ADVANTAGES /

The equipment life span increases by a factor of 5-15 due to the material's high corrosion resistance. Corrosion processes can be monitored using non-destructive test methods. Lower cost as compared to the similar materials (e.g. the cost of the material 15% lower comparing to 20mm stainless steel due to lower usage of the expensive high-alloyed materials).

### ESSENCE OF INNOVATION /

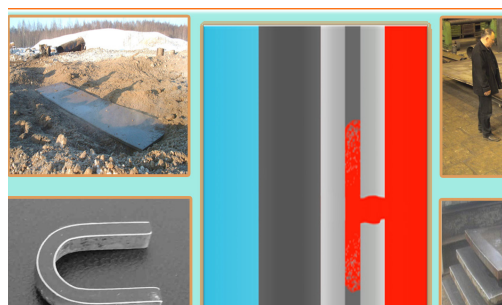
Multilayer materials are created using the explosion welding method. The material's high corrosion resistance performance is achieved by the addition of a protective («sacrificial») layer that transforms the corrosion processes.

### RESULTS ACHIEVED /

Patents were received in more than 30 countries. Multilayer sheets of different types and sizes were produced. A nonmandatory Certificate of conformity for the Russian Federation territory has been obtained.

### MARKET POTENTIAL /

The material can be used to manufacture energy or oil and gas equipment. The size of the market, according to pessimistic estimates, is at least USD 1 billion.



### THE TEAM /

ANDREY E. ROZEN,  
CTO, D.Sc. in Engineering, Author of over 180 scientific studies including 27 patent inventions;  
ANDREY A. ROZEN,  
CEO;  
GENNADY KOZLOV,  
chief engineer, D.Sc. in Engineering.

### CONTACTS /

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## AVTOSTANKOPROM LLC

# MULTIFUNCTIONAL NANOSCALE FILMS BASED ON FLUORINE-CONTAINING SURFACTANT (EPILAMIZATION TECHNOLOGY)

### COMPETITIVE ADVANTAGES /

Multifunctionality and comprehensive protection (anti-friction, corrosion resistance, hydrophobic behavior, bactericidal action, adhesion resistance). Nanofilm thickness - from 3 to 10nm. High temperature stability - up to +520°C.

### ESSENCE OF INNOVATION /

EPILAM - fluoride active composite materials allowing producing multifunctional nanofilm on the surfaces.

### RESULTS ACHIEVED /

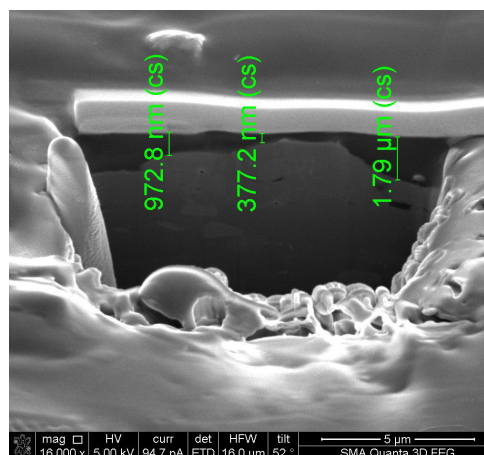
The product is certified. Patents, applications, registered trade marks are available. Technology is approbated on circa 100 customers, which are high-tech enterprises in microelectronics, aircraft engineering, fuel and energy industry, machinery and other industries.

### MARKET POTENTIAL /

DOMESTIC MARKET: Forecast: growth of nano products - 10-fold in 2016 - up to RUB 900 billion.

#### INTERNATIONAL MARKET:

Forecast: the budget of advanced nano developments by 2015 - up to USD 6.2 billion.



### THE TEAM /

A.VOKHIDOV,  
PhD in Economics - CEO and founder;  
A.MISYURYAYEV - Deputy CEO,  
Nanotechnological Society of Russia;  
L.GERVITS,  
PhD in Chemistry - Deputy CEO.

### CONTACTS /

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## ALMAZENERGOBUR LLC

# NANOSTRUCTURED DIAMOND SOLIDITIES AND TWO-LAYER DIAMOND-CARBIDE BLADES FOR ENERGY-EFFICIENT DRILLING AND EQUIPMENT

### COMPETITIVE ADVANTAGES /

These technologies improve the energy efficiency of drilling operations by 30-40%. They excel the properties of the competing solutions by 20-30% and have a lower price.

### ESSENCE OF INNOVATION /

Two-layer diamond-carbide blades have both nanostructured cutting layer and nanostructured carbide substrate. Nanostructure of the solidities and diamond-carbide blades is formed with the use of carbon nanoclusters.

### RESULTS ACHIEVED /

The technology concepts developed, pilot models of diamond solidities and diamond-carbide blades manufactured and tested.

### MARKET POTENTIAL /

The global market of diamond-carbide blades amounted to \$500 mln in 2012. By 2017, the market will reach USD 600-700 million, by 2022 – USD 900-950 million.



### THE TEAM /

**VLADIMIR BLANK,**  
Dr. Sci. in Physics and Mathematics, professor. Director of TISNCM Federal State Budgetary Scientific Institution  
Publications: articles, monographs – 261, inventions – 16, study guides – 3.  
**SERGEY PERFILOV,**  
Ph.D. Overall experience in this industry - 26 years.

### CONTACTS /

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GRANTEE

## NEW SILICON TECHNOLOGIES LLC

# DEVELOPMENT OF SILICON CARBIDE ON SILICON (SiC/Si) WAFERS AND HETEROSTRUCTURES FOR MICRO-AND OPTOELECTRONICS BASED ON THESE WAFERS

### COMPETITIVE ADVANTAGES /

The technology for creation of SiC/Si is cheaper as compares to rival solutions. SiC/Si wafers have better thermal and electrical conductivity. Silicon can be easily removed that allows to make separate wafers of silicon carbide and gallium nitride.

### ESSENCE OF INNOVATION /

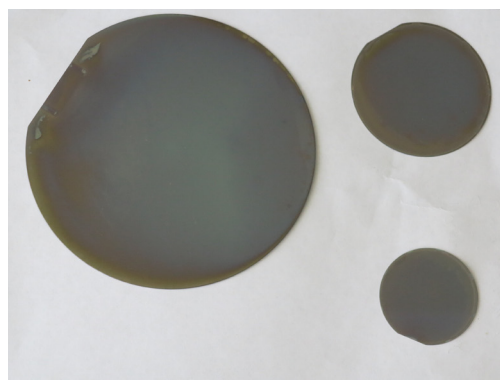
Epitaxy of SiC/Si, in which the porous layer between SiC and Si is formed directly during growth. Porous layer leads to significant relaxation of the elastic strain between Si and SiC and reduces defects in SiC wafers.

### RESULTS ACHIEVED /

Currently manufactured SiC/Si 6-inch wafers and GaN heterostructure on SiC/Si 2-inch wafers.

### MARKET POTENTIAL /

The global market of wafers for semiconductor devices is estimated at tens of billions of dollars per year. In quantitative terms, the market exceeded 9 billion square inch of wafers in 2012.



### THE TEAM /

ANDREY LUKYANOV,  
PhD (Techn.), project leader, CEO;  
SERGEY KUKUSHKIN,  
D. Sc., Prof., lead developer, h-index 13.

### CONTACTS /

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## PERFECT CRYSTALS LLC

# SUBSTRATES BASED ON GALLIUM NITRIDE (GaN) FOR SEMICONDUCTOR ELECTRONICS

### COMPETITIVE ADVANTAGES /

The project's product is capable of providing a new generation of devices based on GaN:

- doubled LED energy efficiency;
- increased operating currents in power electronics devices;
- reduced size of high-power devices.

### ESSENCE OF INNOVATION /

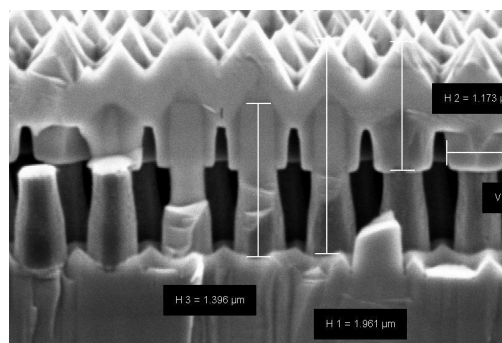
Growth technology allows producing flat epitaxial layer which is controllably separated from the seed layer inside the reactor. Low dislocation density of less than  $10^6 \text{ cm}^{-2}$  due to effective low-cost postgrowth treatment.

### RESULTS ACHIEVED /

Laboratory samples of 2-inch wafers. It was demonstrated that the dislocation density of the linings can be reduced to  $10^5 \text{ cm}^{-2}$ . The reactor for the growth and processing of GaN wafers with a diameter of up to 4 inches is currently under development.

### MARKET POTENTIAL /

In 2012, the market for GaN wafers was approximately USD 300 million. The market has significant growth potential in case of wafers cost reduction.



EHT = 5.00 kV  
WD = 5.5 mm  
Signal A = InLens  
Stage at T = 0.7 °  
Date :29 Aug 2012  
Time :17:20:46

### THE TEAM /

**VLADIMIR NIKOLAYEV**,  
PhD senior researcher at Ioffe Institute,  
CEO; experience in CREE Research EED.  
Author of more than 80 scientific papers  
and 7 patents;  
**MARINA MYNBAYEVA**,  
senior researcher at Ioffe Institute.

### CONTACTS /

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## POLIGRIS R&D CENTER LLC

# NEW FUNCTIONAL ADDITIVES TO LUBRICATING COMPOSITIONS BASED ON MODIFIED POTASSIUM POLYTITANATE

### COMPETITIVE ADVANTAGES /

Improving tribological characteristics of special lubricants, increasing their properties resulting in two-fold decrease in cost. Constant fractional composition and the absence of adverse impurities. Stability under extreme operating conditions.

### ESSENCE OF INNOVATION /

As a functional (antifricition and antiwear) additive to lubricating compositions we propose to use modified potassium polytitanates introduced as suspensions in specially selected media.

### RESULTS ACHIEVED /

The following was developed and patented:

- laboratory method for obtaining modified potassium polytitanate as nanosized flakes;
- method of introducing polytitanates as oleophilic dispersions into oleophilic medium.

### MARKET POTENTIAL /

The global market of lubricants with molybdenum disulphide additives in 2012 amounted to more than USD 1 billion.

### THE TEAM /

ALEXANDER GOROKHOVSKY,  
Project Leader, Professor, Doctor of Chemistry, author/co-author of basic patents;

DMITRY ARISTOV,  
Project Manager, RVC expert professional;

ANATOLY PALAGIN,  
Chief Technologist, co-author of basic patents;

GENNADY SHUISKY,  
Chief Engineer, chemical technologist;

SERGEY KHORYUKOV,  
economist, arbitration manager.

### CONTACTS /

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## NPO TOKEM LLC

# MONODISPERSE ION EXCHANGE RESINS FOR APPLICATIONS IN THE ENERGY, CHEMICALS, METALLURGY, PHARMACEUTICALS AND OTHER INDUSTRIES

### COMPETITIVE ADVANTAGES /

Uniformity factor below 1.05 against the existing level of 1.1, which allows increasing the speed of processes, reducing the hydraulic resistance and power consumption by 20-25% and increasing the life of ion exchange resins up to 12 years.

### ESSENCE OF INNOVATION /

Production technology of polymer monodisperse particles by suspension polymerisation.

### RESULTS ACHIEVED /

The lab samples with a uniformity factor of 1.02 were obtained that confirm the possibility of 1.05 of uniformity factor in a pilot plant.

### MARKET POTENTIAL /

World consumption of ion exchange resins is 600,000 m<sup>3</sup> to the value of more than USD 1.1 billion.



### THE TEAM /

VLADIMIR TIKHOMIROV, head of research and development department; ALEXANDER DMITRIEV, Dr. Sc., Prof., Head. Department of Low Temperature, director of the Centre for High technology of the Moscow Power Engineering Institute; BRIAN SPOLDING, CHAM Ltd., UK managing director, prof., Foreign Member of the Russian Academy of Sciences.

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## FOTOPLAST LLC

# ENERGY-EFFICIENT MULTI-LAYER FILM COATINGS WITH VARIABLE LIGHT TRANSMISSION. ENERGY SAVINGS FOR HEATING AND COOLING OF THE HOUSING

### COMPETITIVE ADVANTAGES /

Energy savings due to IR-reflective coating corresponding to the characteristics of low-emission silicate glasses. Photochromic films work automatically and are 3-5 times cheaper than electrochromic devices. The solution does not require connection to the power supply.

### ESSENCE OF INNOVATION /

Two functions are combined in one film element - reflection of infrared radiation and automatic reduction of light transmitted in the visible range, depending on the intensity of solar radiation. The photochromic film darkens automatically in bright sunshine. In the summer, it reflects radiant heat outside, and in the winter heat radiates inside the room.

### RESULTS ACHIEVED /

The samples of the experimental film reflect 80% of infrared radiation and reduce the transmission of light in the visible range by 30-70%, depending on the intensity of the solar radiation.

### MARKET POTENTIAL /

The global market for "smart" glass, which includes the product under development, will amount to USD 1.9 billion in 2013. The expected growth rate of the market is 12.8% per year (estimated BCC Research).



### THE TEAM /

VYACHESLAV GRACHEV,  
CEO, co-founder;  
VALERY BARACHEVSKY,  
R&D manager, co-founder;  
ANTON AIT,  
Executive Director, co-founder;  
MARAT MITUSHEV,  
Commercial Director, co-founder;  
JEAN-CLAUDE MICHAUD,  
scientific consultant.

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