

SPS «EUROCHIM»

group of companies

Custom synthesis
Fine organic synthesis
Polymer chemistry

About SPS «EUROCHIM»

SPS «EUROCHIM» was founded in 1992 on the basis of the laboratory of All-Russia Research and Development Institute of Petrochemical Processes (VNIINeftekhim, Saint-Petersburg).

Currently SPS «EUROCHIM» is a diversified group of companies, consisting of the following activities:

1. Scientific researches, technical and engineering support.
2. Wholesale trade of synthetic rubber, chemicals and automotive tyres.
3. Real estate management.

Innovative directions in the activity of SPS «EUROCHIM»

- ✓ **Liquid-phase isoprene synthesis technology. Licensor.**
Implemented at OJSC «Nizhnekamskneftekhim».
- ✓ **Thermal cracking of phenol tar technology. Licensor.**
Implemented at SABIC company.
- ✓ **Oxygen-containing by-products refining technology.**
Implemented at OJSC «Nizhnekamskneftekhim» and «SIBUR Togliatti» Ltd.
- ✓ **MTBE production technology. Licensor.**
Implemented at OJSC «Nizhnekamskneftekhim» and OJSC «TAIF-NK».
- ✓ **Research in synthesis of phenol, acetone, bisphenol A.**
- ✓ **Production of antiseptics – boron ethers, based on by-products of isoprene production.**
- ✓ **Fine synthesis, fine organic synthesis, polymer chemistry.**

Innovative directions in the activity of SPS «EUROCHIM»

SPS «EUROCHIM» owns 143 patents, as well as analogous patents: European, German, French, Japanese, Canadian and Chinese.

Usually there are about 3-4 patent applications pending at patent offices.

Custom synthesis

The direction of custom synthesis has been actively developing by the company since 2007.

At the initial stage the main customers were foreign companies.

The new phase started in 2014 due to the activity of Russian manufacturers in solving the problems of import substitution and searching for analogous substances and compounds which were previously imported (mainly from China and India).

Competitive advantages of SPS «EUROCHIM»

- 1) development of methods for product synthesis on the basis of technological, economic and implementation simplicity requirements;
- 2) development of analytical methods;
- 3) manufacturing the products up to 100 kg (for some products quantities up to mt are available);
- 4) developing and scaling up the technologies for manufacturing products of different quantities, searching for production premises for arranging large-scale production, preparing and maintaining implementation and operation;
- 5) working in close contact with the customer;
- 6) competitive prices and quicker delivery in comparison with foreign suppliers;
- 7) modern laboratory (renovated in 2013);
- 8) developing equipment customized to solve certain problems;
- 9) laboratory specialists consist of about 50 employees working in flexible teams.

Basic equipment

- 1) Glass and stainless steel reactors of 15, 30 and 100 l.
- 2) Sealed compartment with 150 l volume to work with substances, sensitive to atmospheric moisture.
- 3) Magnetic stirrers IKA, including those with remote control of surface temperature, mechanic gears with rotation moment 0,2 N*m.
- 4) Heating blocks with heating element power 1,5 - 2,2 kWt, remote temperature control.
- 5) Heating and refrigerating blocks -40 - 150°C with cooling power 1 kWt.
- 6) Modern laboratory furniture, typical glass/ceramic/plastic vessels.

Separation equipment

- 1) Glass, ceramic and polypropylene filters with volumes up to 20 l, surge pumps with capacities between 5 and 120 l/min.
- 2) Rotary evaporators IKA with cube capacities up to 3 l.
- 3) Fractional distillation columns (2 pieces):
 - ✓ Length: 2 m.
 - ✓ Device with reflux ratio control.
 - ✓ Cube volume 5 l.
- 4) Vacuum pumps for distillation in high vacuum (up to 0.001 mm Hg), measuring equipment for estimating residual pressure in the interval of 10^{-1} - 10^5 Pa.

Equipment for operations under pressure

Autoclave:

- 1) Volume: 1000 ml.
- 2) Operating temperature: up to 300°C.
- 3) Operating pressure: up to 130 atm.
- 4) Equipped with a stirrer with the function of smooth control of rotation rate.
- 5) Made of stainless steel AISI 316.

Autoclave for heterogeneous processes:

- 1) Operating volume 0.25 l.
- 2) Equipped with a stirrer with rotation rate of 3000 rpm.
- 3) Operating temperature up to 200°C.
- 4) Operating pressure up to 80 atm.
- 5) Made of stainless steel.

Customized equipment

Rectification unit

A column consisting of 4 parts of different heights with an opportunity to rearrange them and load the feed to different parts.

The column is insulated throughout the height with active compensation of heat losses.

All data from sensors and automation units are controlled by automation module, and the control bodies are submitted to the workplace of the unit operator by special software.

All changes to the working mode and current parameters are automatically recorded in the electronic journal of the unit.

- ✓ Height: 2.5 m.
- ✓ Internal devices: helical prismatic stainless steel cap.
- ✓ Number of theoretical plates: depending on the task.
- ✓ Operating pressure: from -0.1 to 1 MPa (selected)
- ✓ Capacity: from 10 to 500 ml/hour.
- ✓ Cube volume: 700 ml.
- ✓ Operating temperature from 20 to 250°C.

The unit is equipped with the following sensors and automation units:

- ✓ Thermocouples.
- ✓ Pressure sensors.
- ✓ Reflux automat.
- ✓ Cube level gage.
- ✓ Automatically controlled heating.

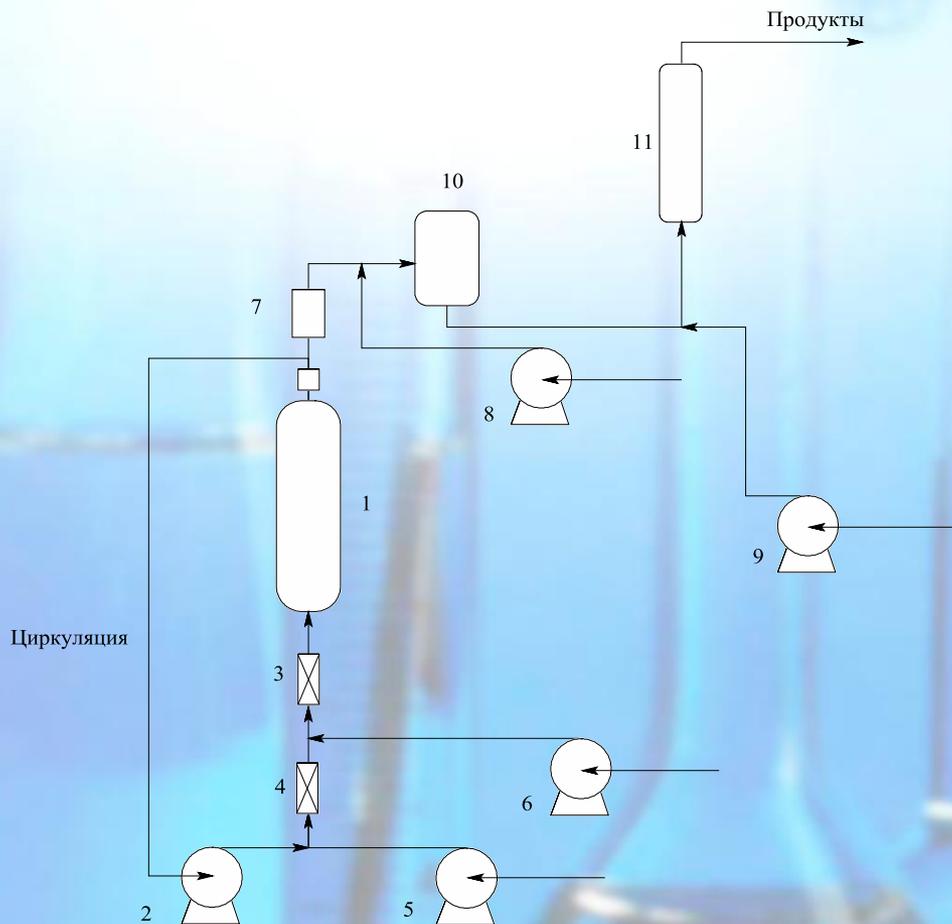
Customized equipment

Flow unit for chemical conversions under pressure

- 1) Maximum operating temperature up to 220°C.
- 2) Maximum pressure up to 16 atm.
- 3) Reactor is made of corrosion resistant material incoloy 825.
- 4) Reactor volume – 400 ml.
- 5) 4 inputs. Feed flow rate up to 1000 ml/h.

Customized equipment

Unit for studies of kinetics and reaction mechanisms, refining the processes for obtaining organic substances



Temperature-controlled glass reactor 1 with volume of 10 ml, circulation pump 2, blenders 3 and 4, dosing pumps 5, 6, 8 and 9, cuvettes 7 of IR spectrophotometer of neighboring IR area, intermediate vessel 10, steel reactor of the second stage 11 with volume of 5 ml.

Customized equipment

Unit for studies of kinetics and reaction mechanisms, refining the processes for obtaining organic substances

Main characteristics:

- 1) Possibility to use the reactors separately.**
- 2) Software control of dosing pumps with additional control of mass flow feed rate.**
- 3) Flow analysis of multi-component reaction mass in situ by method of IR spectroscopy in neighboring IR area on Guided-Wave 412 device.**
- 4) Circulation rate of the first reactor loop: up to 1000 ml/h.**
- 5) Feed flow rate 1-50 ml/h.**
- 6) Catalyst flow rate 1-40 mcl/h.**
- 7) Operating temperature of the first stage reactor – up to 150°C, second stage reactor – up to 160°C.**

Analytical group

1. Development of analytical methods and adjustment of the existing GOSTs, articles and patents.
2. Creating and transfer of methods for enterprises of chemical industry. Creating of operating instructions and Enterprise Standard Samples for operation of analytical equipment.
3. Purity control for individual substances.
4. Standardization of proprietary samples for methodic and commercial purposes.
5. Analytical control, start-up or regulations change maintenance of the technology process.
6. Typical analysis of petrochemical industries:
 - ✓ titration;
 - ✓ bromine value determination;
 - ✓ hydroxyl value determination;
 - ✓ viscosity measurement, etc.

Analytical group. Equipment

1. GLC.

Gas chromatographs Kristall 5000.2, Shimadzu.

Total number of devices: 10 ps.

Capillar columns Agilent of different length and polarity, detectors: PID, catharometer.

2. HLPC.

Chromatograph Dionex UltiMate 3000, detector DAD UV/VIS, columns C18 of different length.

3. Water determination.

Karl Fischer Titrator C20. Mettler Toledo. Range 1 – 50000 ppm.

Negotiations with customers on custom synthesis

1. Specification of the product, work and services: creation and discussion.
2. Reviewing and discussing opportunities to match customer's specification.
3. Contract – design and discussion:
 - ✓ for product synthesis: contract for the first trial batch.
 - ✓ for works and services.
4. Contract execution.
5. Delivery.
6. Communication of further cooperation.

Optimization of substance obtaining processes

Optimization of chemical processes encompasses the complete cycle of the following procedures:

- 1. Customization of trial research units for certain chemical processes.**
- 2. Selection of concentrations of reactants, catalysts, etc.**
- 3. Determination and optimization of thermal effects.**
- 4. Determination of mechanisms of target and secondary reactions by typical methods of physical organic chemistry (determination of activation parameters, kinetic methods of research, acidic function determination, separation and determination of by-products structure, etc.)**
- 5. Revealing parameters influencing the selectivity of organic reactions on the basis of the obtained data. Testing processes on trial units.**
- 6. Optimization of physical and chemical methods of product separation.**

Production of fine organic compounds

Working on complex projects:

1. Optimization of production methods and development of monomers of different classes. We have gained experience in working with slightly stable substances and developed methods of their separation.
2. Optimization and development of substituted phenols and polyphenols with controlled content of micro-impurities, including substances used as analytical standards.
3. Development of the technology and production of trial batches of carboxyanhydrides of aminoacids, resulting in wide experience in handling and purifying of substances, slightly stable in atmospheric conditions; working experience in inert atmosphere.

Other tasks comprising different types of organic reactions:

1. Electrophilic chlorination of alkenes by gaseous chlorine (unit capacity 3 mol/h).
2. Suzuki reaction.
3. Electrophilic substitution in aromatic nucleus (alcylation, nitration, bromation, sulfation etc.).
4. Different syntheses based on inter-phase catalysis.
5. Different syntheses with formation and disclosure of oxiranes.
6. Wittig reaction and its modifications, including E/Z-selective versions.
7. Recovery of nitroaromatic compounds by different reducing agents (iron, sulfides, catalytic hydrogenation).

Strategic projects in fine synthesis

1. **Synthesis of problematic intermediates for pharmaceuticals (previously imported from China).**
2. **Synthesis of quality organic compounds for the company producing reagent compositions for EIA and PCR (the compounds were also previously imported).**
3. **Synthesis of substances for pre-clinic research within innovative researches under grants of “Skolkovo” fund.**
4. **Studies in polymer chemistry: development and production of sorbents for HLPC columns for several manufacturers.**

Polymer chemistry

Apart from classic organic synthesis, SPS «EUROCHIM» conduct researches in polymer and material chemistry.

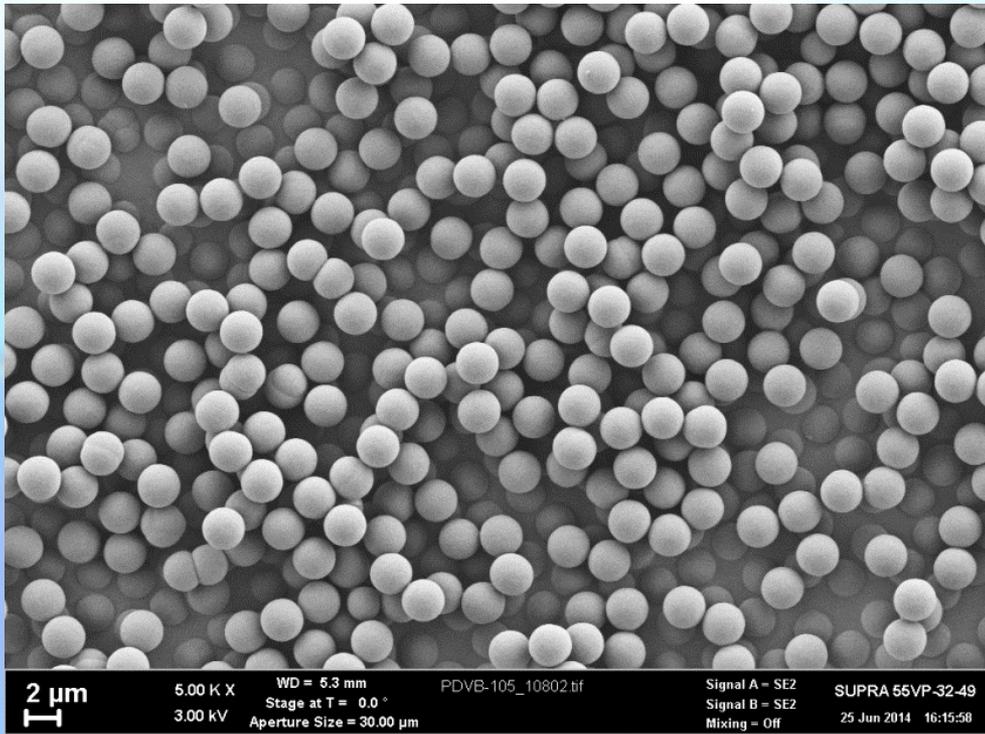
This direction comprises:

1. Development of the technology for production of highly cross-linked styrene-divinylbenzene microspheres, used as template for manufacture of HPLC sorbents.

At the moment the technology is at the stage of final pre-sales trials.

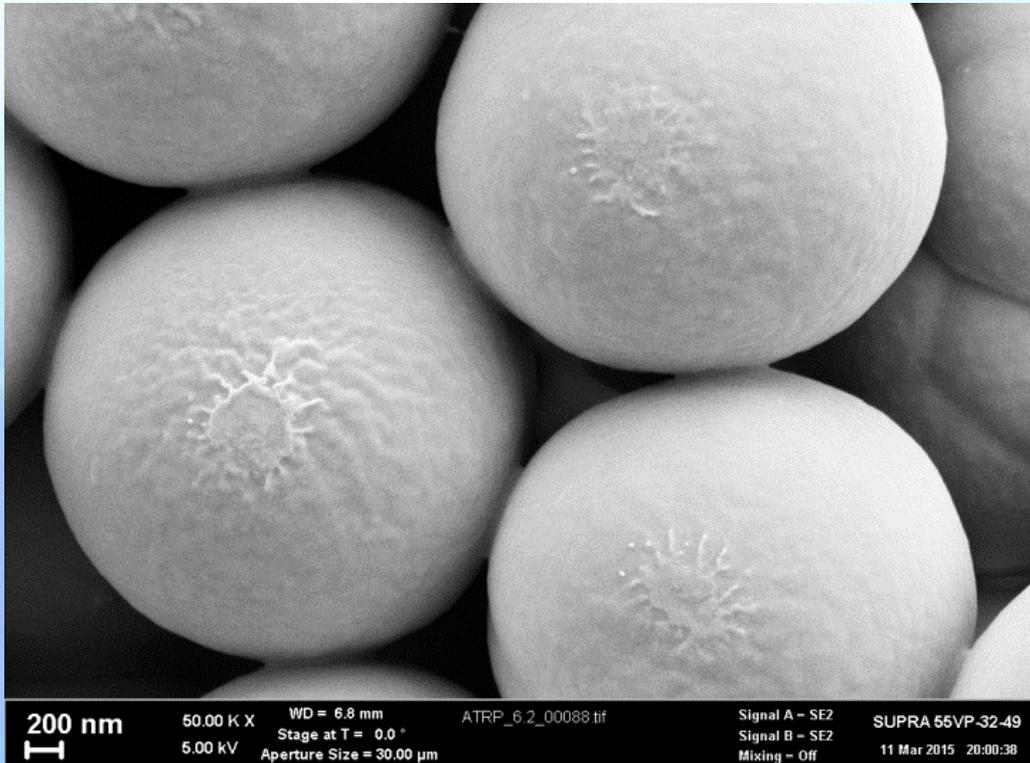
2. Development of modification methods for polymer particles by methods of controlled polymerization RAFT, ATRP etc.

Polymer sorbents description



Cross-linking degree: up to 80%.
Polydisperse index within the range: 1.03-1.15.
Size between 2.5 and 3.5 μm.
Extreme pressure – up to 200 atm.

Polymer sorbents modification



The developed methods of surface modification allow to grow polymers of different chemical nature on the surface of particles – hydrophobic, hydrophilic, ion-exchange and optically active.

The figure shows particles with grafted polyacrylamide. Hydrophilic surface of particles allows to use them for proteins separation.

Thank you for attention!