



ROSENERGOATOM

TERMOXID

Industrial production of Ion-selective inorganic sorbents For nuclear industry

Solving Environmental Issues

Termoxid today:



- Subsidiary of the JSC "Concern Rosenergoatom"
- Founded in 1994

Activities:

- Manufacture of the Termoxid-brand inorganic sorbents
- Development of the new sorbents production technologies based on zirconium, titanium and tin compounds

Termoxid sorbents application area:

Decontamination of the process water of nuclear power plants and other nuclear facilities:

- treatment of lew of nuclear reactors
- purification of spent fuel pool water and SNF storage
- evaporation plants condensates and bottoms
- Treatment of condensates and bottom evaporator
- regenerative solutions of the ion-exchange resins
- drain water
- residual water
- emergency situations consequences elimination
- using in radionuclide generators for medical purposes



Basic properties of the sorbents

- High radiation resistance
- High chemical and thermal resistance
- High selectivity to radionuclides
- Long service life

The sorbents are produced using the unique sol-gel technology, which is implemented on an industrial scale.

Sorbents are mechanically strong spherical pellets ensuring low hydrodynamic resistance of the bulk layers.

The use of the Termoxid sorbents allows the considerable reducing of the liquid radioactive waste volumes, personnel irradiation and the emission of the radionuclides into the environment.



Product range



Sorbent name	Basic physico-chemical properties	Main purpose
Termoxid-35	<p>Appearance: Spherical pellets of dark or light green color</p> <p>Material: Mixed crystalline nickel hexacyanoferrate (ferrocyanide), distributed on an inorganic zirconium hydroxide carrier</p> <p>Size of pellets: 0.4-1.0 mm</p> <p>Bulk density: 1.11 kg/dm³:</p> <p>Moisture, wt: 37-42%</p> <p>Exchange capacity for cesium from a 0.1 N solution of CsCl: 0.45-0.55 mol/kg</p> <p>Coefficient of cesium distribution in the NPP LRW simulated solution: Above $1.0 \cdot 10^4$ dm³/kg</p>	Removal of cesium radionuclides from the process waters with different degrees of mineralization.
Termoxid-3A	<p>Appearance: Glass-like pellets, close to the spherical shape</p> <p>Material: Zirconium phosphate</p> <p>Size of pellets: 0.4-1.0 mm</p> <p>Bulk density: 1.05 – 1.10 kg/dm³:</p> <p>Moisture, wt: 35-40%</p>	Purification of waters of the SNF cooling and storage ponds from cesium radionuclides, cobalt, manganese, etc. in the pH range from 6.0 to 8.5. It is also used in a mixture with the Termoxid-3 sorbent at the local facilities for the additional purification of the drinking water from the heavy metals.

Product range



Sorbent name	Basic physico-chemical properties	Main purpose
Termoxid-3K	<p>Appearance: Glass-like pellets, close to the spherical shape</p> <p>Material: Modified hydrated zirconium dioxide</p> <p>Size of pellets: 0.4-1.0 mm</p> <p>Bulk density: 1.05 kg/dm³:</p> <p>Moisture, wt: 45-50%</p>	It is used in the bulk filters for the selective purification of liquid radioactive wastes from strontium radionuclides in the pH range from 8.5 to 12.
Termoxid-3	<p>Appearance: Glass-like pellets, close to the spherical shape</p> <p>Material: Hydrated zirconium dioxide</p> <p>Size of pellets: 0.4-1.0 mm</p> <p>Bulk density: 1.05 kg/dm³:</p> <p>Moisture, wt: 45-50%</p>	It is used as a filtering load component in the local facilities for additional purification of the drinking water from anions.
Termoxid-5M Termoxid-52M	<p>Appearance: Pellets of spherical and ellipsoidal shape, from white to yellow</p> <p>Material: Hydrated titanium dioxide</p> <p>Stabilizing additive: Zirconium and tin dioxide</p> <p>Size of pellets: 0.2-1.0 mm</p> <p>Bulk density: 1.2 /1.7 kg/dm³:</p> <p>Static exchange capacity as per Mo: 50-86 mg/g</p>	It is designed to isolate Mo-99 radionuclide from the acidic solutions

Advanced sorbents



Sorbent name

Main purpose

Termoxid-38

It is designed for cleaning gas and vapor-gas environments from iodine radionuclides

GDT-M

It is designed to purify the primary water at the nuclear power plants at operating parameters from corrosion products of structural materials and other impurities in a colloidal and coarsely dispersed state.

Experience in the use of the "Termoxid" sorbents in the nuclear industry



Beloyarskaya NPP Termoxid-3A

First stage SNF cooling and storage ponds water purification systems

The technology of water purification from europium radionuclides was developed for the third-stage SNF cooling and storage ponds



Kalininskaya NPP Termoxid-35

1st and 2nd stage drain water processing system (SVO-3)

Application in the distillate post-treatment filters, used to clean the SVO-5 unbalanced and regenerative waters



Novovoronezhskaya NPP Termoxid-35

Guaranteeing filters on the 1st, 2nd and 3rd stage unbalanced waters discharge lines

Sorbent tests with the real LRW:

- Primary circuit coolant;
- SNF ponds water;
- Bottoms of the evaporation plants;
- Special laundry spent water;
- Unbalanced "pure" condensate of the evaporation plants.

Plant for the ion-selective purification of the 3rd stage CPS regenerative water



Experience in the use of the "Termoxid" sorbents in the nuclear industry



Balakovskaya NPP
Termoxid-35

Additional purification of the unbalanced water
(SWP evaporation plants distillate)



Kolskaya NPP
Termoxid-35

It is used in the LRW processing complex as part
of an ion-selective treatment plant



Smolenskaya NPP
Termoxid-35

It is used in the LRW processing complex as part
of an ion-selective treatment plant



South-Ukrainian NPP
Termoxid-35

Cleaning of process water in accordance with
the project documentation



Experience in the use of the "Termoxid" sorbents in the nuclear industry



Bushar NPP (Iran)
Termoxid-35

Process water treatment



Kudankulam NPP (India)
Termoxid-35

Process water treatment



Tianwan NPP
Termoxid-35
Termoxid-3A

Removal of radionuclides from the process waters according to project documentation



FGUP "Atomflot"
Termoxid-35
Termoxid-3k

Purification of the process waters of the Russian Atomic Icebreaker Fleet



Many years of experience in the use of the "Termoxid" sorbents at the nuclear facilities in Russia and abroad have shown their high efficiency in the decontamination of the process waters, which is confirmed by the reports on the practical application of the sorbents in the process systems and equipment.



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