



December 20, 2013

RUSNANO Portfolio Company ICM Glass Kaluga Begins Producing Foam Glass Granules

ICM Glass Kaluga, a portfolio company of RUSNANO, has initiated production of foam glass granules in Kaluga Oblast. The company is the first in the Russia to produce the material, which has many beneficial attributes and broad application in the construction industry. RUSNANO CEO **Anatoly Chubais** and the governor of Kaluga Oblast, **Anatoly Artamonov**, took part in the ceremonies that launched the new industrial complex.

The company's technological complex is designed to produce 300,000 cubic meters of foam glass per year. The project, begun in November 2011, has a total budget of 1.8 billion rubles, including 1.2 billion rubles in cofinancing from RUSNANO. ICM Glass Kaluga expects to reach design capacity in the first quarter of 2015. Because the scientific developments and global standards that underlie ICM's manufacturing model are well adapted to automation, the company will employ 50 individuals when design capacity is achieved.

Cellular foam glass is a multi-purpose construction material favored for significantly increasing the service life of structures, making buildings far more energy efficient, ensuring that thermal and sound insulation is high, and reducing total expenditures for construction, maintenance, and repair. Foam glass may be used as a universal particulate for thermal insulation in practically all types of construction—industrial, civil engineering, road and highway, housing and utility, and agricultural construction. It is suitable as weight-bearing and drainage materials for construction of roads and agroindustry objects where ground is weak, unstable, or waterlogged.

There is an important environmental role for the new company in Kaluga Oblast to play as well. Since the raw material for ICM's production of cellular foam glass is ordinary crushed glass, ICM will effectively reprocess household and municipal solid waste, reducing the need for landfill or other waste solutions.

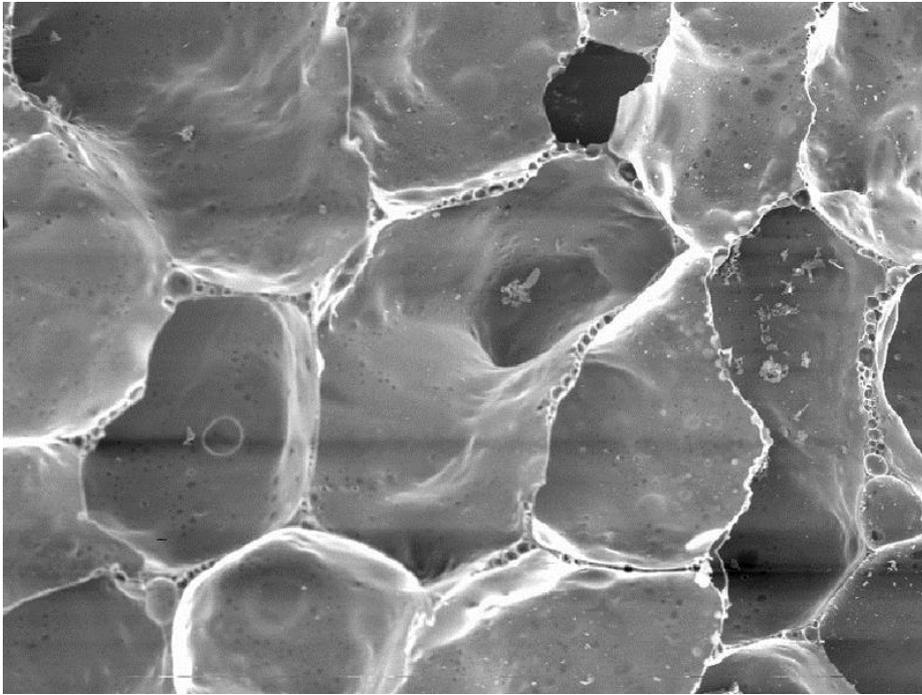
ICM Glass Kaluga plans carry out a number of pilot projects in Moscow and in Kaluga and Ryzan Oblasts.

Technical information

Feedstock for production of cellular foam glass, crushed glass, is entirely composed of minerals, environmentally neutral and safe for humans. The technology of production is based on the ability of silicate glass to soften at high temperatures. Glass waste is first crushed to powder and then, using special tunnel kilns, the powder is baked to 950 °C. The glass turns to foam, leaving the kiln as foam glass. The material is then rapidly cooled, to nearly room temperature, causing it to shatter into foam glass granules.



The distinguishing feature in the production process that ICM Glass Kaluga employs is liquid reagents. The reagents are mixed with the powdered glass to cause formation of a 100-nanometer film on the surface of the glass granule.



Structure of foam glass granules as seen through an electronic microscope

The foam glass granules contain an abundance of closed air capsules or cells that suffuse the material with its most valuable properties—superior insulation (thermal conductivity reaches 0.08 W/m K) and very light weight (a standard 50-liter bag weighs about eight kilograms).

Cellular foam glass has a number of other advantages:

- The wide temperature range (from $-250\text{ }^{\circ}\text{C}$ to $+650\text{ }^{\circ}\text{C}$) within which the material can function makes it possible to use foam glass in every climatic zones and in almost all industrial spheres.
- The service life of the material is practically limitless. Foam glass granules retain their characteristics for more than 100 years, equaling or exceeding the useful life of most structures.
- Foam glass does not contain organic material that might lose its properties over time. Being entirely inorganic, the material does not attract rodents. And the mineral composition of foam glass makes it chemically and biologically inert and absolutely noncombustible.
- Foam glass is impervious to aggressive environments.
- The material is economical: Its use simplifies the process of thermal insulation and lessens the amount of consumables that must be used in production, lowering its cost. After foam glass has served its purpose and



been dismantled, it may be used again. Its light weight, long service life, and imperviousness to environmental factors lower expenses overall and make transportation and storage worthwhile.

The chief competitors to cellular foam glass in the construction materials market are traditional polyurethane foam, polystyrene foam, mineral wool (primarily glass wool) and expanded clay. In comparison, foam glass granules have overwhelming advantages.

RUSNANO was founded as an open joint stock company in March 2011, through reorganization of state corporation Russian Corporation of Nanotechnologies. RUSNANO's mission is to develop the Russian nanotechnology industry through co-investment in nanotechnology projects with substantial economic potential or social benefit. Its primary areas of investment are optoelectronics and nanoelectronics, mechanical engineering and metalwork, solar energy and energy conservation, medicine and biotechnology, and nanostructured materials. The Government of the Russian Federation owns 100 percent of the shares in RUSNANO. **Anatoly Chubais** is CEO and chairman of the Executive Board of RUSNANO.

Work to establish nanotechnology infrastructure and training for nanotechnology specialists, formerly conducted by the Russian Corporation of Nanotechnologies, has been entrusted to the Fund for Infrastructure and Educational Programs, a non-commercial fund also established through reorganization of the Russian Corporation of Nanotechnologies. For more information, please visit the company's website at www.rusnano.com.

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