**Description**

Sibirfoam is a heat-insulating (thermal conductivity 0.06-0.28 W/mK) foam of the type of foamglass with low density (200-900 kg/m$^3$), closed porosity (pore diameter 0.5-5 mm), and high compression and bending strength (up to 18 MPa and 6 MPa, correspondingly). This frost-, fire- and water-proof material is environment friendly, easily configured, and has an original decorative outlook. Sibirfoam is manufactured by foaming zeolitic compounds at 800-900 °C (low-temperature technology) or 1100-1200 °C (high-temperature technology) and is offered as granulated or blocky material with a homogeneous porous or a brecciated structure. The brecciated structure is produced by foamed zeolitic angular fragments (5-30 mm, unicoloured or cloudy) cemented in a monochromatic porous matrix. Natural colour varies from white and grey to various reddish-brown shades depending on composition, manufacturing conditions, or artificial colouring.

Homogeneous porous and brecciated structure of Sibirfoam

**Technical appraisal and economic benefits**

The Sibirfoam production is run in a single stage and does not require preliminary melting and granulation commonly applied in foamglass production. Marked secondary porosity and natural microcrystalline structure (crystals 0.5-5.0 µm) of zeolite allows charge making without thin grinding and high homogenization. The production cycle includes zeolitic tuff grinding, mixing with technological additives, charging into heat resistant moulds, and foaming in a fire furnace.

Blocky Sibirfoam can be used in supporting elements of buildings due to their strength higher than in the traditional foamglasses (see comparison of physical and mechanical properties in the Table).

| Physical and mechanical properties of Sibirfoam versus traditional foamglass |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Density, kg/m$^3$ | Compression strength, MPa | Thermal conductivity, W/mK | Temperature range, °C |
| Foam glass | Sibirfoam | Foam glass | Sibirfoam | Foam glass | Sibirfoam |
| 150–200 | 200–300 | 0.8–4.5 | 3.5–6.0 | 0.064–0.102 | 0.06–0.093 | –180 to +400 | –180 to +900 |

Use of overburden and low-grade zeolitic rocks in scale production of Sibirfoam increases economic efficiency of deposits and reduces environmental damage due to the reduction of opening-related spoil area. The adaptation of the product in industrial and civil construction is expected to reduce capital outlays and costs and save at least 5% of maintenance costs.

Warming 1 m$^2$ of wall with Sibirfoam saves 68 kg of equivalent fuel yearly, which is a 3400 kg saving for a three-room apartment. (M. Sashko “Technological progress”, Krasnoyarsk).
Application areas
Sibirfoam is mainly applied in civil and industrial construction as heat-insulating and decorative material, or as support in low-rise buildings. Brecciated Sibirfoam can serve as heat- and sound-insulating nice-looking decoration. Granulated Sibirfoam is an effective and light concrete aggregate and heat-insulating charge. Sibirfoam is applicable in machine building, including ship- and plane manufacturing, production of power and thermal equipment, etc.

Development stage
Operation of Sibirfoam plants is more efficient in the vicinity of active mines. One such plant is currently under construction by a research-and-production company TseNS (the Sakhaptinskoye zeolitic tuff deposit, Krasnoyarsk region).

Patent situation
Seven RF patents.

Commercial offers
Joint Venture. Investment.

Estimated cost
The estimated cost of a plant for low-temperature Sibirfoam production including all project documents is 6-7 million US$.

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