SCHUPP®

simply high temperature technology

Economical use of products made of

high-temperature insulation wool (HTIW)

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HEATING | INSULATION | MEASURING

Economical use of **products made of high-temperature insulation wool (HTIW)**

For companies, in which high temperature processes take place, for e.g. above 1250 °C, there are a lot of challenges for economical and technically efficient use of their high temperature furnaces/plants. That includes **ensuring process reliability**, **reducing operating costs** and **increasing productivity** of each furnace.

Depending on the application, ultra-lightweight products made of high temperature insulation wool (HTIW) like polycrystalline alumina wool (PCW) with its excellent thermal, thermomechanical and chemical properties, represent a more advantageous solution as traditional refractory products.

WHAT IS HIGH-TEMPERATURE INSULATION WOOL (HTIW)?

High-temperature insulation wool (HTIW) is synthetically produced from mineral raw materials. To the group of HTIW belongs:

- Alkaline Earth Silicate Wool (AES) up to 1200 °C process temperatures,
- Alumino Silicate Wool (ASW) or also known as Refractory Ceramic Fibre (RCF) for process temperatures up to 1400 °C and
- Polycrystalline Alumina Wool (PCW) for process temperatures up to 1600 °C.

Based on high-temperature insulation wool, which is also used as raw material, further ultra-lightweight products like blankets, modules and vacuum-formed shapes for process temperatures up to 1800 °C are produced.

WHAT IS THE DIFFERENCE BETWEEN ASW/RCF AND PCW?

ASW/RCF are amorphous fibres, produced in a melting process of, among others, alumina (Al_2O_3) and silica (SiO_2). The Al_2O_3 content is between 45 % and 55 %. The application of ASW/RCF products is usually carried out below the classification temperature of 1400 °C, that is usually in the temperature range from 600 °C up to 1300 °C.

In contrast to high-temperature insulation wool based on polycrystalline alumina wool (PCW) these fibres are produced in a „sol-gel process". The Al_2O_3 content is between 72 % and 97 %. At approximately 72 % Al_2O_3 and approximately 28 % SiO_2 it is called mullite fibre. Products made of polycrystalline mullite/alumina wool (PCW) are used, depending on the application and the chemical requirements, already at 800 °C, but usually from 1250 °C up to 1800 °C. Furthermore, PCW is not classified in Europe according to classification, labelling and packaging CLP (EC Regulation No. 1272/2008) in contrast to ASW/RCF.

WHAT ARE THE BENEFITS OF USING PCW?

Using PCW material offers three major benefits:

- ensuring process reliability,
- increasing productivity of a furnace,
- reducing operation costs.

PCW enables the **reduction of operation costs** in many ways. On the one hand, the material contributes to energy savings thanks to its insulation properties. Because of their technical performance, PCW products minimise downtimes of a furnace and therefore unnecessary maintenance, assembly and repair work. Moreover, in comparison to other refractory products, such as refractory concrete, no drying times are required. As a result, the furnace will be faster available for the production. PCW material has excellent, almost unlimited thermal shock resistance (TSR). Therefore, the **productivity of a furnace** can be increased by faster heating-up and cooling-down rates. PCW products can make a significant contribution to **process reliability**, especially in critical application areas of a high-temperature process, where specific requirements on durability and downtime are needed.

In summary, PCW products are beneficial wherever very specific chemical, thermal and thermomechanical stability are essential.

IN WHICH APPLICATIONS IS PCW MATERIAL FROM SCHUPP® CERAMICS SUCCESSFULLY APPROVED?

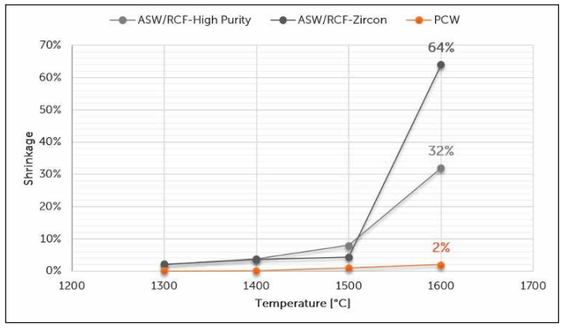
The range of possible applications for PCW products in all industries with high temperature processes is basically given. Following are some examples in which PCW blankets from SCHUPP® Ceramics are successfully approved.

PCW blankets and wool from SCHUPP® Ceramics are sold under the brand name **ITM-Fibermax®**. **ITM-Fibermax®** 1600 blankets are needled, very flexible and based on polycrystalline mullite/wool with 72% alumina content. They are available in different thicknesses and densities (see data sheet). The range of applications for blankets includes:

- base material for (combination) modules,
- use at process temperatures up to 1600 °C,
- sealing of furnace doors in industrial and laboratory furnaces,
- base material for further processing like cuts, stamping parts, stripes,
- use as expansion joint material in high temperature plants,
- depending on the specific application use in alkaline process atmospheres,
- use in processes with high thermomechanical material stress.

ITM-Fibermax® are used as **base material** for PCW and combination modules in the ceramics industry, technical ceramics, petrochemical industry, steel industry etc. and other furnaces with temperatures above 1250 °C or in special chemical (e. g. alkaline or inert gas) atmospheres.

Thanks to its **low shrinkage** at temperatures up to 1600 °C (1 %) ITM-Fibermax® blankets enable a safely use in critical furnace/plant areas. The following diagram shows that PCW has a much lower shrinkage compared to ASW/RCW. The lower shrinkage offers for the user a bigger safety range up to the classification temperature and contributes to process reliability.

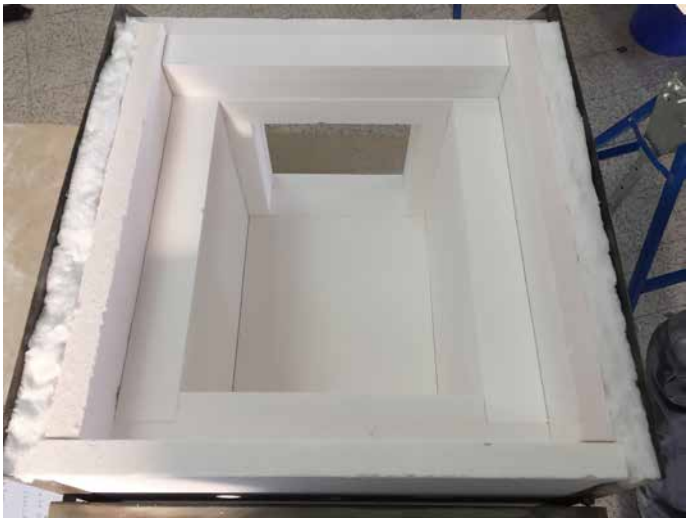


Permanent linear shrinkage of the grades ASW/RCF-high purity, ASW/RCF-zircon and PCW at 24h in a laboratory furnace under oxidising atmosphere.

Own figure based on: Tonnesen, T., Dietrichs, P., Telle, R. (2005): Linear shrinkage, resilience and microstructural changes in high temperature insulating wools in maximum use temperature range, in: Advances in Applied Ceramics, Vol. 104, 2005, No. 5, Pages 249-255.

THE SPECIAL PROPERTIES OF ITM-FIBERMAX® BLANKETS.

Thanks to its **tensile strength** and **easy handling**, ITM-Fibermax® blankets are the base material for further processing like cuts, stamping parts or stripes, which are used e.g. as seals and expansions joints in refractory linings of larger high temperature furnaces/plants. Our blankets are also used as a "buffer" to prevent damage in the application like as a "flexible damper" between the outer metal sheet and boards or rather vacuum formed parts in laboratory or special furnaces.



ITM-Fibermax® as "flexibel damper" between outer metal sheet and boards in a high temperature laboratory furnace.
Photo: SCHUPP® Ceramics.

ITM-Fibermax® 1600 blankets have a v**ery high fibre content** and a **very low shot content**. The shot content is only <1 % (mesh 212 µm) compared to other high-temperature wools such as alumino silicate wool and alkaline earth silicate wool (approximately 50 %). As a result, the material can be perfectly used in applications in which the material is exposed to **thermomechanical stress** like vibration and torsion.

Furthermore, the blankets have excellent **resilience** and **flexibility** – even after many years of use. A good resilience is particularly important in industrial furnaces as expansion joint material to compensate changes in length of the refractory products by hot /cold cycles and to ensure process reliability.

WHAT CAN SCHUPP® CERAMICS DO FOR YOU?

- ✓ Have you found your application?
- ✓ Do you have other high temperature processes or projects, where our material could be of interest?
- ✓ Are you looking for a technically innovative solution for thermal insulation and to maintain your process reliability?

Then get in touch with us. We are looking forward to receiving your inquiry.

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