Advanced Ceramics – Impervious and Porous Haldenwanger Engineering Ceramics by Morgan Advanced Materials

HALDENWANGER, a division or Morgan Advanced Materials is the producer of high temperature, fine ceramics.

HALDENWANGER fine ceramics offer:

- Components with reduced wall thickness and therefore lower heat absorption
- Components having higher thermal shock resistance allowing increased heating rates
- Light, but mechanically strong and thermally stable kiln furniture, which is suitable for fast firing
- Thin, self-supporting designs

Impervious Materials

Alsint 99.7

Best, high temperature, ceramic material for kiln construction with 99,7% Al_2O_3 (the difference is mainly MgO and SiO_2).

- Type C 799 according to DIN VDE 0335
- Refractoriness up to 1700 °C
- Good thermal shock resistance due to high thermal conductivity
- High mechanical strength
- High electrical resistivity

Recommended applications:

- High working temperature, chemical attack, e.g. hydrogen and other reducing gases
- Clean kiln atmosphere
- Thin-walled designs having high thermal shock resistance

Pythagoras 1800 Z

Impervious, mullite high performance material

- Refractoriness up to 1600 °C
- Very high thermal shock resistance
- High mechanical strength
- High electrical insulation even at high temperatures
- Evaporation extremely low, therefore no contamination of kiln atmosphere; no reaction with heating element
- Most suitable material for radiant heating tubes
- Kiln tubes made of Pythagoras 1800 Z can be very thin-walled

Pythagoras

Most economical, mullite material for kiln components

- Type 610 according to DIN VDE 0335
- Application temperatures up to 1400 °C
- Very good chemical resistance against gases free of fluorine
- For kiln working under normal conditions Pythagoras has a good thermal shock resistance and good mechanical strength.
- Pythagoras is a very economical material being used as impervious protection sheaths and insulators for temperature measurement.

Halsic-I

Silicon infiltrated reaction bonded silicon carbide (SiSiC)

- Reaction bonded SiC matrix, free of pores, with residual metallic silicon
- High temperature ceramics for highest mechanical loads
- Extremely good oxidation resistance
- Large sized components possible

- Application temperatures up to 1350 °C
- Corrosion resistant against strong acids and alkaline solutions
- High thermal conductivity

Porous Materials

Alsint Porous

High purity, porous 99.5% Al_2O_3

- Better thermal shock resistance than Alsint 99.7
- Refractoriness is similar to Alsint 99.7
- Similar chemical resistance to Alsint 99.7
- Reducing gases, even pure hydrogen, do not attack Alsint porous.
- Alsint porous is mainly used for the manufacture of ignition dishes and crucibles, but also for porous outer protection tubes for thermocouples.
- Isostatic pressing is possible, so that large tubes can also be manufactured.
- Muffle tubes

SKA 100 NG

High purity, porous 99.5% Al_2O_3

- Refractoriness up to 1700 °C
- High thermal shock resistance
- Good chemical resistance
- SKA 100 NG can be used in protection furnaces with reducing or even hydrogen atmospheres.

SKA 100 NG as well as Alsint:

- Does not react with the heating elements, no contamination of the kiln atmosphere due to evaporation.
- Is most suitable for the porous, outer protection tube for thermocouples that must

withstand very strong chemical attacks.

Sillimantin 60 NG

A specially developed material for use in kiln manufacture having an Al_2O_3 content between 73 – 75%.

- Low porosity
- Good thermal shock resistance
- No reactions with the heating elements
- Working temperatures of up to 1650 °C
- Special shapes possible for bridging long distances between supports
- Excellent chemical resistance.
- No contamination of the kiln atmosphere through evaporation.
- Suitable for kilns with a high temperature gradient
- Sillimantin 60 NG can be used under severe conditions as the outer protective tube in temperature monitoring devices.

Sillimantin 60

Most frequently used ceramic material in kiln designs

- Type C530 according to DIN VDE 0335
- Application temperatures up to 1400 °C
- Refractoriness up to 1300 °C (subject to loading for roller applications)
- No reactions with heating elements
- This material can be formed using most moulding methods.
- Numerous special designs are possible as well as a wide range of standard tubes
- This material is used successfully in laboratory and industrial kilns.

Sillimantin 65

A specially developed material for use as rollers having an Al_2O_3 content between 78 – 80%

- Refractoriness up to 1350 °C (subject to operational loading)
- Negligible reaction with glazes because of fine porosity

Sillimantin KS

Most economical for support tubes

- Refractoriness up to 1300 °C
- Good mechanical strength
- Large scale production with emphasis on the most commonly used diameters permitting economical manufacture.

Silicon Carbide

Conventional, clay-bonded silicon carbide

- Excellent thermal conductivity allows the manufacture of thick-walled components having high mechanical strength.
- Furnace tubes with high thermal shock resistance
- Can be used in oxidising atmospheres up to 1400 °C
- High mechanical strength because of a large wall thickness
- Sighting tubes for optical temperature measurement Outer protection tubes for temperature measurement up to 1200 °C in light and heavy metal smelts

Fused Silica

99.8% SiO_2

- Very low thermal expansion
- Excellent thermal shock resistance
- Can be used continuously at temperatures up to 1000 °C

This material is used for:

- Rollers in glass tempering furnaces
- Crucibles in high-frequency melting
- Riser tubes for continuous casting
- Crucibles withstanding high thermal shock

Halsic-R

Recrystallised silicon carbide (RSiC)

- Compact SiC matrix with open porosity
- Classic ceramic for high temperature applications
- Large sized components possible
- Reliable bonding of coatings
- Application temperatures: 1600 °C (oxidising) and approx. 2000 °C (under protective atmosphere)
- Resistant against strong acids and alkaline solutions

Halsic-RX

Chemically doped recrystallised silicon carbide ($RSiC_{doped}$).

- Compact SiC matrix with open porosity
- Very good oxidation resistance Multiple increased life time compared to Halsic-R
- Ideal material for porcelain fast firing
- Large sized components possible
- Reliable bonding of coatings
- Application temperatures up to 1650 °C (oxidising)

Source: Morgan Advanced Materials

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