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# **Graphite Compound**

The perfect solution for heat transfer surfaces in corrosive environments.

















### **TECHNOFORM:** Leading partner for thermally and mechanically optimized profile solutions







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HEAT

XCHANGER

**Our motivation:** Existing challenging trade-off between main requirements of heat transfer surfaces



heat conductivity pressure resistance acid resistance fouling properties economic efficency

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**Our motivation:** Existing challenging trade-off 2022 between main requirements of heat transfer surfaces **Fluorpolymers, Glas** limits in pressure resistance & heat conductivity **Stainless steels** high limits in corrosion resistance Unique balance between **Graphite compound** all main requirements limits in corrosion resistance High(er) grade steels **Impregnated graphite** limits in fouling properties Alloys, Hastelloy, Monel limits in long-life corrosion resistance Material **Acqusition costs** 🌀 Ohmstede

VAHTERUS

*elliott* 





**Graphite compound:** A new class of material for heat transfer surfaces

2022

Full graphite tubes need complexe and energy-heavy production steps

Development of a **heat conductivity optimized extrusion** process for a **"graphite compound"** 









#### **Graphite compound:** A new class of material for heat 2022 transfer surfaces

- Acid resistant against virtually all common fluids
- ✓ Great **thermal conductivity** for corrosive environments
- ✓ ASME-certified pressure resistance
- Almost **no fouling** properties
- Economic efficiency over the entire operating time of a heat exchanger



#### ...let's have a closer look on the different material properties.

















### **Corrosion resistance:** Advantages of graphite compound in terms of acid resistance



Graphite (compound) counts as one of the most chemically resistant materials

#### **Organic chemistry**

Graphite is resistant to virtually **all media** in the field of organic chemistry and therfore for almost **all common chemical proccesses**.

#### **Inorganic chemistry**

Graphite is resistant to **almost all inorganic media** like **many acids and bases.** 

Limitations of graphite compound

Strong oxidizing acids (e.g. nitric acid)

Mixed acids can cause unpredictable reactions and must be tested

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### **Corrosion resistance:** Advantages of graphite compound in terms of acid resistance



Pure Sulphuric Acid



Temperature, °C

Sulphuric Acid with 2000ppm Chloride

Temperature, °C



Isocorrosion diagram, 0.1 mm/year, in naturally aerated sulphuric acid of chemical purity. Broken-line curve represents the boiling point.

Isocorrosion diagram, 0.1 mm/year, in sulphuric acid with an addition of 2000 ppm chlorides.





### **Corrosion resistance:** Advantages of graphite compound in terms of acid resistance.



Flexural strength of graphite compound after exposure to H2SO4 60% @ 140°C



Hexitallic



Start of laboratory test













...and after

**180 days** 





## **Thermal conductivity:** The "alpha-factors" have a great influence on the overall performance



Gas at minimum on one site



#### Fluids on both sites





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## **Pressure resistance:** Certified material for almost all kinds of pressurized heat exchangers



**Burst pressure along operating temperatures (24x1,5mm):** 



WARD



#### **Pressure resistance:** Certified material for almost all kinds of pressurized heat exchangers



**ASME Boiler & Pressure** Vessel Code VIII for UIG (PRT)





















### **Fouling properties:** Fouling causes significant performance reductions of a heat exchanger



Influence of deposits on thermal conductivity:

Fouling comparison in an operated heat exchanger:



Impregnated graphite







Dust

16

14

12

10

8

6

4

2

0

Heat conductivity [W/mK]



Lined steels

PFA

Glas









## Important successfully completed projects by heat 2022 exchanger type







#### We would be pleased to write another success story together with you...





#### ...so, let's talk heat transfer solutions!











