

# Tailor-made solutions for the chemical & petrochemical industry.

**Top quality refractory materials.**



**RATH**

# Specialist for top technology in high temperature.

**Quality with an optimum  
price-performance ratio.**

Rath offers the ideal combination of tradition and innovation. The result: optimum refractory solutions for a wide range of applications. All items in our broad product portfolio are manufactured in-house. With carefully selected materials and precision processing techniques, we can guarantee top quality.

The Rath sales teams are focussed on the sector and familiar with its specific requirements; our technical offices provide the necessary engineering and assembly know-how. This means we can offer our customers individual, complete refractory solutions with an optimal price-performance ratio.

*The Rath sales team*

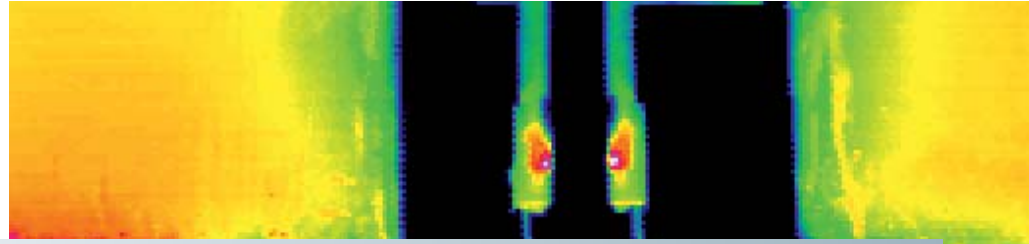
## **Greater efficiency in chemical production.**



*Convection zone panel (petrochemical cracker)*

Our products guarantee energy savings and help to protect the environment at a time of rising energy costs and increased environmental awareness. For the chemical, petrochemical and hydrocarbon industry in particular, this is a decision factor.

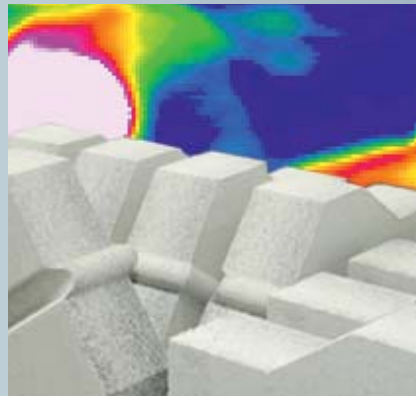
The industry typically operates a high number of ovens, furnaces and reactors interactive. As a result it is absolutely essential to plan refractory life and maintenance schedules. With its clear and targeted focus on quality and innovative solutions, Rath is the ideal refractory solutions partner for the chemical industry.



## Always expect us to be one step ahead.

The chemical, petrochemical and hydrocarbon industry is a very complex industry which typically operates equipment not only at high temperatures. However despite the fact that temperatures may not be the ultimate challenge, the additional chemical and physical wear and tear requires production units to utilize high-performing refractory.

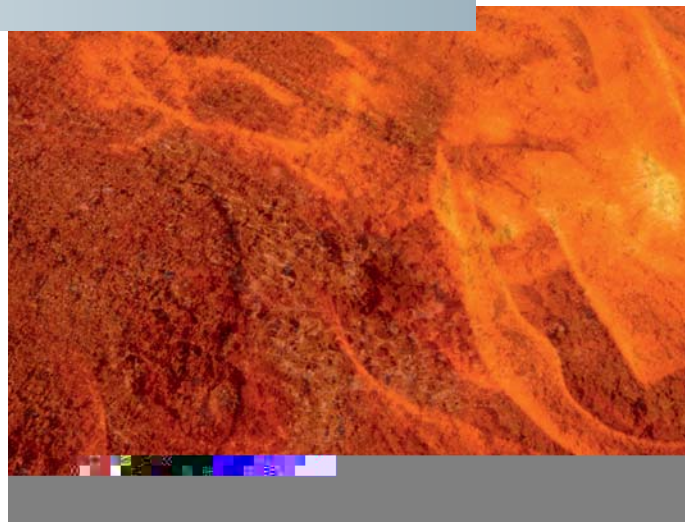
Rath supplies refractory materials for any equipment whether it is part of a refinery, a fertilizer plant or a chemical complex.



*Korrath bricks during production*

## Precision is the order of the day.

Rath has a number of engineering departments where working drawings are produced for refractory linings destined for a range of applications. The complexity of thermal, chemical and physical attack onto refractory linings means in-depth knowledge and great experience are required in construction.



*Fluidized bed reactor*

# Refractory solutions in all shapes and forms. Just ask.



*Radiation zone (petrochemical cracker)*

Rath is a global partner to the chemical, petrochemical and hydrocarbon industry providing unique refractory

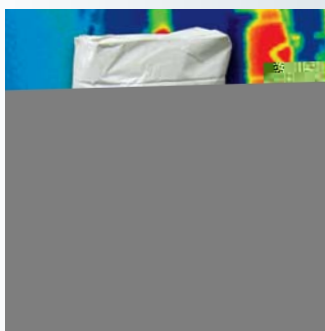
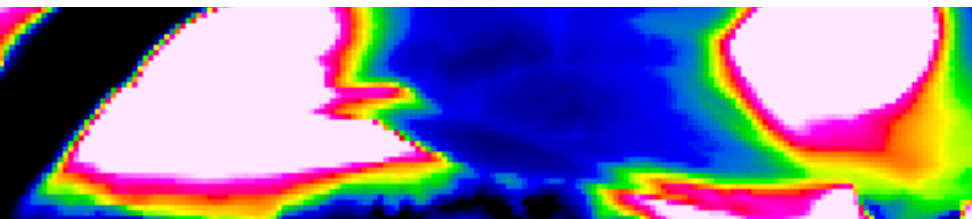
- Crackers
- Reformers
- Synthesis gas reactors
- Hydrogen, carbon monoxide, methanol and ammonia production
- Gasification reactors for liquids and solids
- Incinerators for gases, liquids, slurries and solids
- Sulphur recovery units (SRU) – Claus reactors
- Fired heaters, CO boilers, cyclones, hot lines, etc.
- Petroleum coke calciners
- Carbon black reactors and dryers
- Titanium dioxide pigment reactors and many others

## We're eager to solve your problems.



*Convection zone tube shield (petrochemical cracker)*

Not only high temperatures but also aggressive and reducing atmospheres, acids, slag, scale, dust, very high gas velocities as well as mechanical wear characterise the refractory challenge in this industry. Strategically Rath has chosen to supply highest quality products. We support our customers with a lining that will not only fulfil the required job, but provide the most cost effective refractory system.



Carath - castable



Kerform - vacuum formed shape

## We're happy if things start to heat up.

Equipment used in the chemical, petrochemical & hydrocarbon industry requires primarily good refractory insulation without direct contact to chemically aggressive substances. Rath provides a wide product portfolio of insulating materials including Alsitra & Altra mats and modules, Carath insulating castables, Porrath insulation fire bricks and Kerform vacuum-formed boards and shapes to ensure insulation at every temperature i.e. for crackers, reformers, combustion chambers, etc.

Altra mats and modules not only provide highest insulation but also provide very good resistance against reducing atmospheres.

Chemically challenging applications require typically Korrath bricks or Carath castables based on high purity corundum. Zirconia, chromium or silicon carbide may be added to achieve special properties.

### Dense Bricks\*

Name	Acrath S 1-t	Suprath A 30-t	Suprath T 501	Durrath HSC	Durrath HD 45	Silrath AK 60 C	Alurath SP 78	Alurath B 85 C
Raw material	Acid-resistant fireclay	Fireclay	Fireclay sillimanite	Fireclay	Low iron fireclay	Andalusite	Alumina spinel	Bauxite
Bulk density [g/cm <sup>3</sup> ]	2.3	2.05	2.4	2.2	2.4	2.6	2.9	2.8
Cold crushing strength [MPa]	≥ 110	≥ 30	≥ 70	≥ 80	100	≥ 100	90	≥ 120
Porosity [Vol.-%]	≤ 12.5	≤ 20	≤ 16	≤ 12	8	≤ 14	18	≤ 20
Thermal shock resistance [n]	6	> 25	≥ 50	> 40	3	≥ 120	2	≥ 25
Chemical analysis [%]								
Al <sub>2</sub> O <sub>3</sub>	46	≥ 30	50	37	47	61	79	85
SiO <sub>2</sub>	-	53	46	59	48	35	-	11
Fe <sub>2</sub> O <sub>3</sub>	< 1.5	≤ 2.1	≤ 1.5	1.5	< 1.4	≤ 1	< 0.5	≤ 1.3

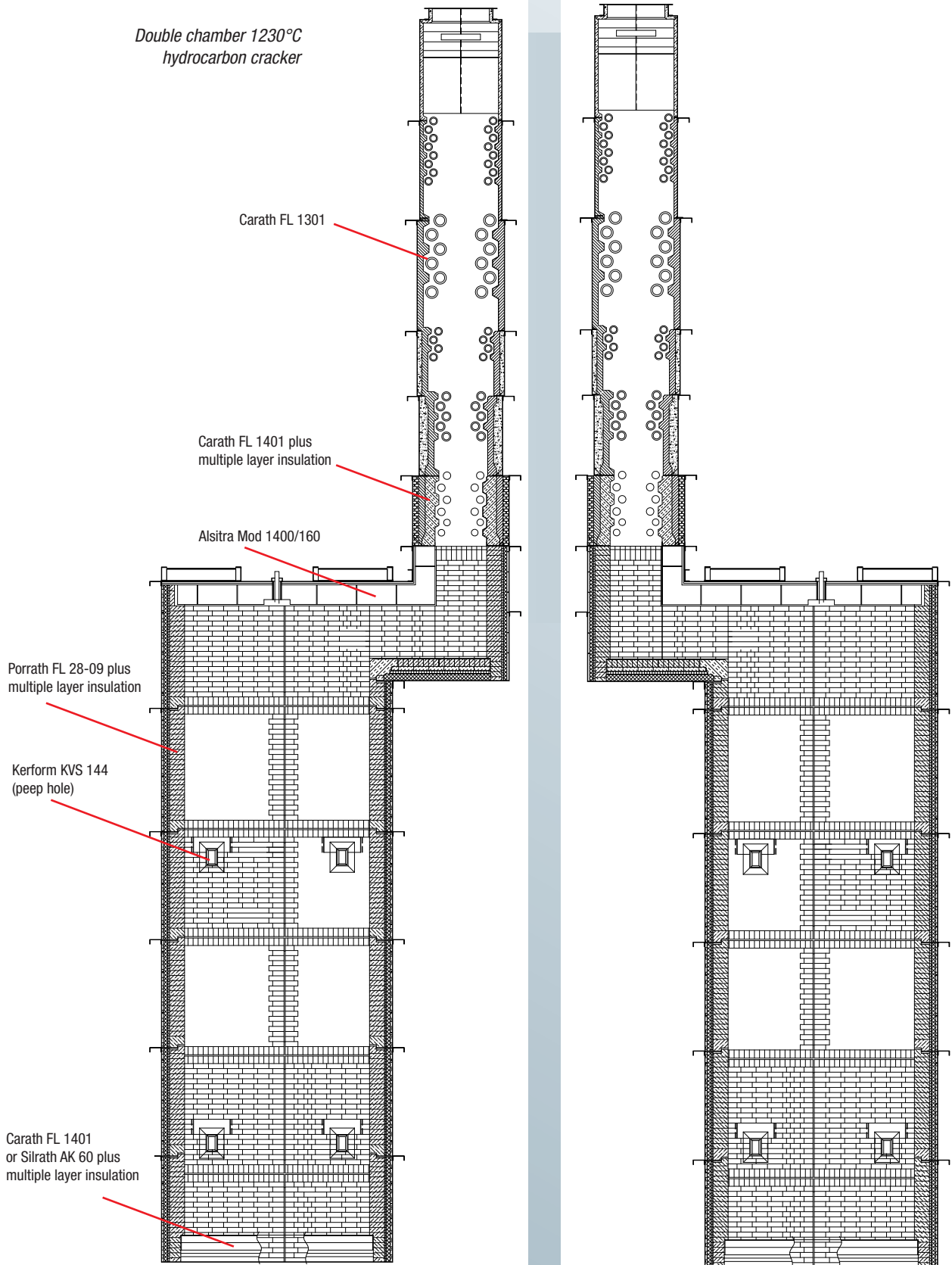
### Porrath - insulating fire bricks\*

Name	Porrath FL 900	Porrath FL 24-06	Porrath FL 26-08	Porrath FL 28-09	Porrath FL 30-11	Porrath FL 32-12	Porrath FL 33-13	Porrath FL 34-15
Raw material	Calcium-aluminium silicate	Aluminium silicate	Aluminium silicate	Aluminium silicate	Aluminium silicate	lightweight aggregates	Bubble alumina	Bubble alumina
Classification temperature [°C]	900	1350	1430	1540	1650	1760	1800	1840
Bulk density [g/cm <sup>3</sup> ]	0.45	0.6	0.8	0.9	1.1	1.25	1.3	1.5
Cold crushing strength [MPa]	1	1.2	3.5	4	5	6	12	12
Chemical analysis [%]								
Al <sub>2</sub> O <sub>3</sub>	15	37	52	63	74	87	91	99
SiO <sub>2</sub>	60	56	44	33	25	12	8	0.1
Fe <sub>2</sub> O <sub>3</sub>	4	1.9	1.1	0.8	0.3	0.2	0.2	0.04

\*All tables in this brochure contain only an extract of the wide Rath product range.

# Complete product portfolio guarantees perfection

*Double chamber 1230°C  
hydrocarbon cracker*

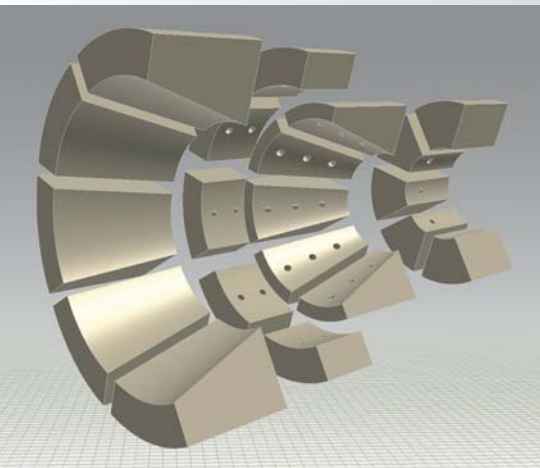




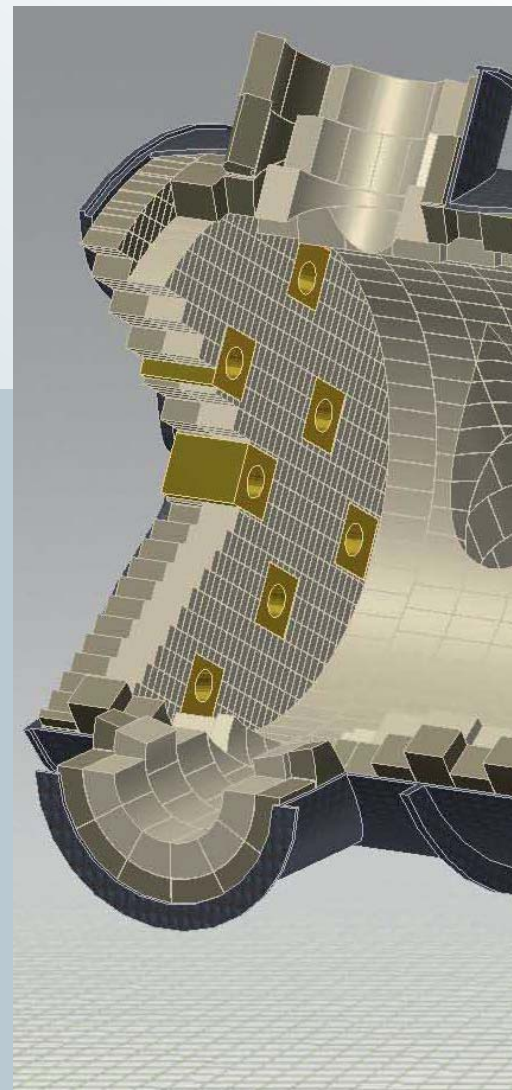
# Highest performance under extreme conditions.

## Hard carbon black

is manufactured by means of the so-called Tread reactor. Extreme temperatures beyond 1900°C, reducing atmosphere, quenching with water and gas velocities beyond the speed of sound require highest quality refractory materials such as high performance mullite or corundum bricks type Korrath and high precision castables type Carath. These Tread reactors also require perfectly shaped bricks to deal with highest gas velocities and pressure differences. Rath choke systems use surface grinded bricks to ensure perfect fit and as a result longest life. Rath carbon black chokes are made from Korrath corundum and chromium corundum bricks.



*Korrath K 99 Choke*



*Carbon black reactor*

## Soft carbon black

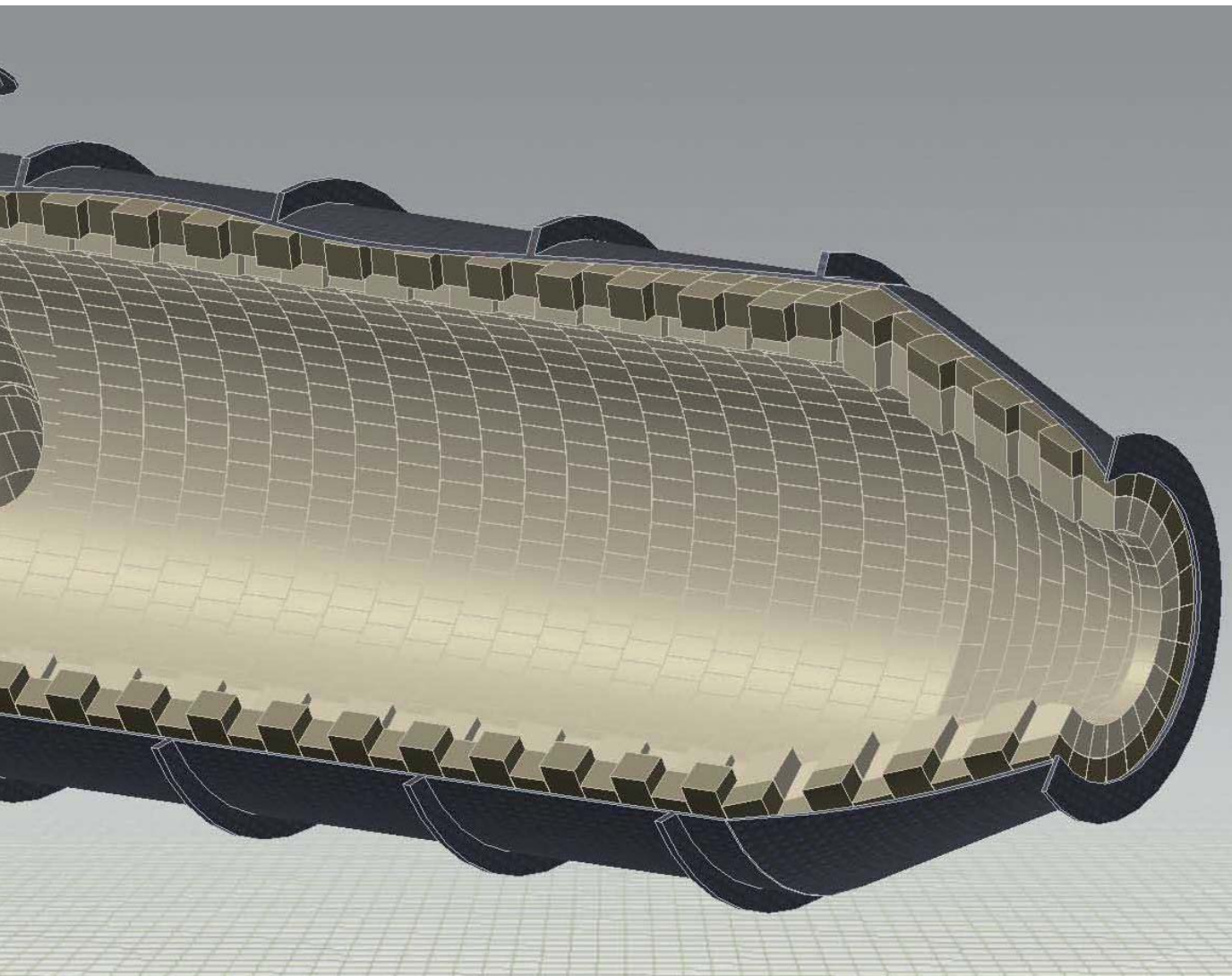
The Carcass reactor is used to produce soft carbon black. Horizontal and vertical designs are in service, which each create new refractory challenges. These reactors operate at slightly lower temperatures than Tread re-

actors; however Carcass reactors pose a challenge due to size and the use of alkali additives. Temperatures usually don't exceed 1600°C and permit the use of mullite bonded corundum bricks such as Korrath.

### Korrath - corundum bricks

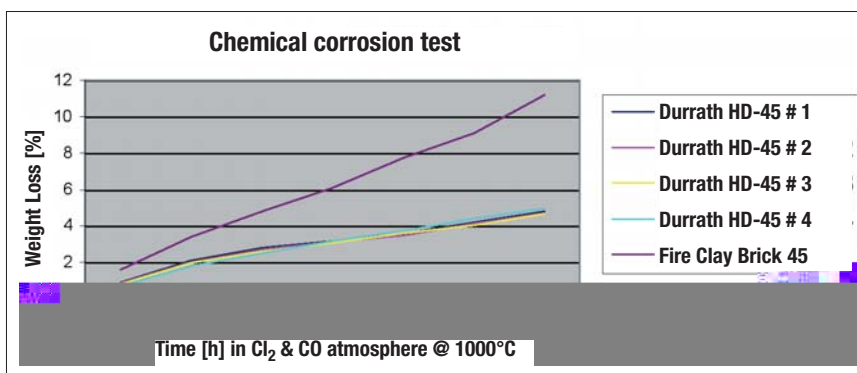
Name	Korrath K 60	Korrath K 70	Korrath K 80	Korrath K 701 Cr30	Korrath K 853 Cr10	Korrath K 901	Korrath K 99	Korrath K 99 E
Raw material	Fireclay corundum	mullite contained fireclay, corundum	mullite contained fireclay, corundum	Alumina	Alumina	Alumina	Tabular alumina	Corundum
Bulk density [g/cm <sup>3</sup> ]	2.5	2.6	2.85	3.5	3.4	3.0	3.15	3.4
Cold crushing strength [MPa]	≥ 60	≥ 60	70	100	> 150	80	90	90
Porosity [Vol.-%]	≤ 20	≤ 19	≤ 17	16.5	14	16	16	13
Thermal shock resistance [n]	≥ 20	≥ 15	> 100	49	16	110	17	8
Chemical analysis [%]								
Al <sub>2</sub> O <sub>3</sub>	61	71	84	71	84	90	99	99
SiO <sub>2</sub>	35	-	14	-	1.25	9	0.1	0.1
Fe <sub>2</sub> O <sub>3</sub>	≤ 1.4	≤ 1.2	< 0.5	0.19	0.15	0.15	0.1	0.1





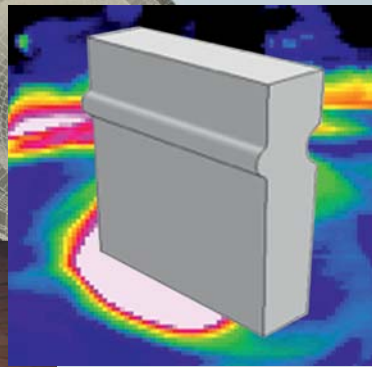
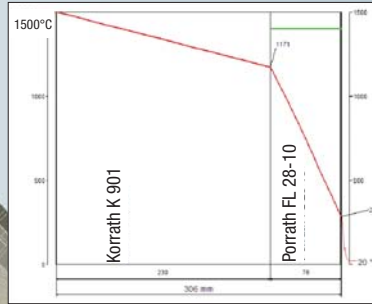
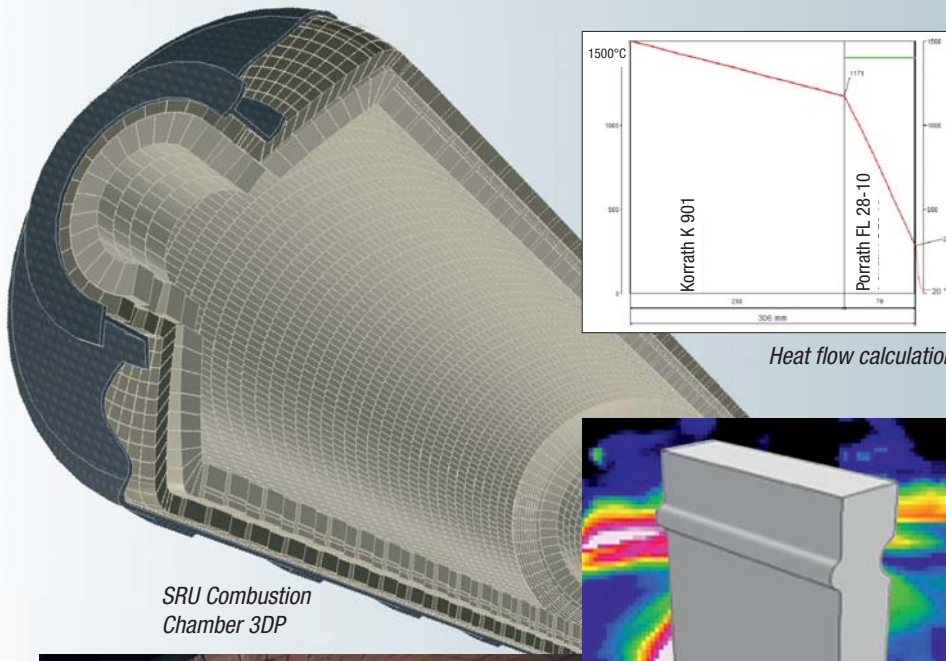
## Chlorinators for titanium tetrachloride production

High quality titanium dioxide pigment is produced by means of the chloride process, i.e. a suitable ore blend is mixed with a source of carbon and the two are reacted in a fluidized bed with chlorine at approximately 700 to 1200°C. Titanium tetrachloride,  $TiCl_4$ , is formed in an exothermic reaction. Oxidation of the  $TiCl_4$  to  $TiO_2$  follows in a second stage. Similar chlorinators may be used to produce titanium sponge.



*Durrath HD-45: high chemical resistance, high mechanical wear resistance, lowest open porosity (6 %), highest thermal capability*

# Excellence in every aspect. For your convenience.



Equipment used in the chemical industry is partially similar to equipment used in petrochemical and hydrocarbon facilities. This applies especially to reformers and crackers, but quite a number of other vessels as well. Rath services producers of monomers, polymers, methanol and ammonia (fertilizer). However Rath also provides refractory solutions to periphery equipment such as combustion chambers, gasification, incinerators and boilers.

## Sulphur recovery unit – Claus reactor

The Claus reactor as part of the SRU (sulphur recovery unit) is just one example where high performance bricks are used. Typically mullite bonded bricks based on white fused corundum provide long and maintenance free operation.

## Carath - unshaped refractories/precast shapes

Name	Dense castables	Ultra-low & low-cement castables			Gunning castables	Insulating refractory castables			
	Carath D 1800	Carath LC 1400	Carath LC 1650	Carath ULC 1804	Carathgun FL 1400	Carath FL 1051	Carath FL 1301	Carath FL 1401	Carath FL 1800
Raw material	Tabular alumina	high mullite fireclay	Tabular alumina	Corundum	light weight fireclay	lightweight fireclay	alumina silicate hollow spheres	lightweight fireclay	Bubble alumina
Material required [kg/m <sup>3</sup> ]	2930	2300	3000	3100	1450	970	850	1400	1400
Cold crushing strength [MPa]	90	100	100	70	24	2.5	9	25	8
Service temperature [°C]	1800	1400	1650	1800	1400	1050	1300	1400	1800
Chemical analysis [%]									
Al <sub>2</sub> O <sub>3</sub>	96	50	93	98.5	55	34	56	45	94
SiO <sub>2</sub>	0.4	41	4	-	30	38	27	35	0.3
Fe <sub>2</sub> O <sub>3</sub>	0.2	1.3	0.1	0.1	< 2.0	8	< 1	3	0.3

# Production in our own factories.

There is one very special feature of Rath: we can always fully guarantee the quality of our highly refractory products, as we manufacture them all ourselves.

State-of-the-art production processes are used in our plants in Europe and the USA. We constantly adapt these processes in line with technical and technological developments as we strive to provide you with top quality.

Our approach benefits our customers: high quality products ensure operational safety and reliability over a long period of time. This means less repairs, less breaks in production and lower costs.



*Krummnußbaum*



*Milledgeville*



*Mönchengladbach*

## Rath meets all ISO criteria.

Quality in production can be measured – with ISO 9001/9002. All companies in the Rath Group are certified according to the strict criteria for this standard. We are doing everything to build constantly on this quality standard.

Our products undergo rigorous testing in our own company laboratories. We also regularly have externally government-authorized recognised test centres check material characteristics.

Our customers can rest assured that all our products are up to date – and provide, in practice, everything that we have promised.

<b>Plastic masses</b>
<b>Carathplast D 1650</b>
Bauxite corundum
2700
40
1650
80
13
1.4

# The Rath Group.

## Our sales subsidiaries worldwide.

### **Aug Rath jun. GmbH**

Walfischgasse 14  
A-1015 Vienna  
Tel. +43 (1) 513 44 26-0  
Fax +43 (1) 513 44 26-86

### **Rath GmbH**

Ossietzkystraße 37/38  
D-01662 Meißen  
Tel. +49 (35 21) 46 45-0  
Fax +49 (35 21) 46 45-86

### **Rath GmbH**

Krefelder Straße 680-682  
D-41066 Mönchengladbach  
Tel. +49 (21 61) 96 92-0  
Fax +49 (21 61) 96 92-61

### **Rath Hungaria Kft.**

Porcelán utca 1  
H-1106 Budapest  
Tel. +36 (1) 43 300 43  
Fax +36 (1) 26 1 90 52

### **Rath Ukrajina TOW**

Prospekt Osvoboshdenije Donbassa 8b  
Office 206  
UA-83048 Donezk  
Tel. +380 (62) 345 33 06  
Fax +380 (62) 345 63 26

### **Rath USA Inc.**

300 Ruthar Drive Suite 1  
Newark, DE 19711  
Tel. +1 (302) 294 4446  
Fax +1 (302) 294 4451

### **Rath žárotechnika spol. s r.o.**

Vorlešská 290  
CZ-544 01 Dvůr Králové n. L.  
Tel. +420 (499) 321 577  
Fax +420 (499) 321 003

### **Rath Polska Sp. z o.o.**

ul. Fabryczna 1  
PL-42 530 Dąbrowa Górnicza  
Tel. +48 (32) 268 47 01  
Fax +48 (32) 268 47 02

### **Rath SAS**

60, route principale du Port  
F-92637 Gennevilliers-Cedex  
Tel. +33 (1) 47 92 80 62  
Fax +33 (1) 47 92 80 22

### **Rath AG per l'Italia**

Im Helui 15  
I-39030 Chienes (BZ)  
Tel. +39 (0474) 56 56 20  
Fax +39 (0474) 56 56 28

**E-Mail: [info@rath-group.com](mailto:info@rath-group.com)**

**Internet: [www.rath-group.com](http://www.rath-group.com)**