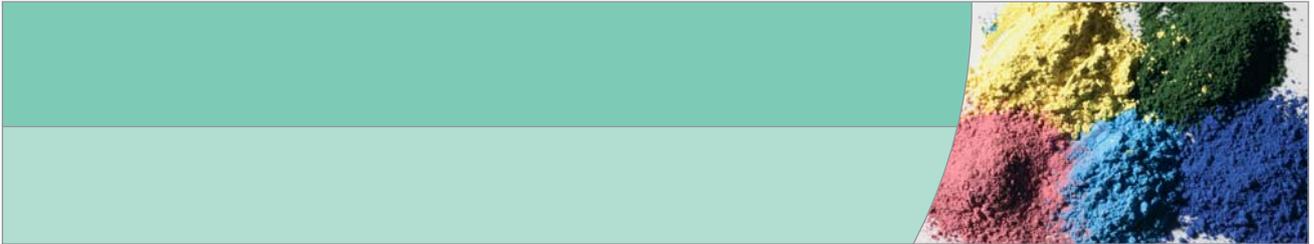


FRIDURIT® Technical Ceramics

Lab worksurfaces - permanently good 'as new'



Perfection and sustainability for successful lab projects

■ ■ ■ Legal notice

Editor

FRIDURIT[®]

The specifications of our products are based on extensive technical development and on the results of stringent tests. We have gained experience in diverse areas of application over many years with FRIDURIT Technical Ceramics. However, the user is responsible for checking our specification and, if necessary, confirming the suitability by conducting his own tests.

We reserve the right to make technical alterations.

This catalogue is also available as a pdf file. Please refer to the following address:

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Why ceramic benchtops in the laboratory?	_____	04
What distinguishes FRIDURIT Ceramics?	_____	05
User-friendly design	_____	06
Material properties	_____	07
Properties		
■ Chemical resistance	_____	08
■ Scratch resistance	_____	09
■ Temperature resistance	_____	10
■ Easy cleaning	_____	10
■ Hygiene	_____	10
■ Ease of decontamination	_____	11
■ Environmental compatibility	_____	11

■ ■ ■ FRIDURIT® Technical Ceramics

Why ceramic benchtops in the laboratory?

Quality in the laboratory

Demands for high quality, made by modern laboratories, increase with the requirements and standards to which the products and services to be delivered are subjected. This also applies to the environment in which tests, analyses and experiments are conducted. Laboratory work surfaces can make a significant contribution to these efforts

provided they can be kept in a flawless, clean and hygienic state.

The condition of laboratory worksurfaces has a significant effect on the impression a laboratory makes. Work environments can help to promote a high-quality work product or create the prerequisites for it in the first place.



FRIDURIT laboratory benchtops: Flawless surface despite intensive use



Stains, discolorations and loss of brilliance e.g. on epoxy benchtops

Permanent perfection

Selecting a benchtop marks an important decision in laboratory planning. How can laboratory work stations be designed with materials which permanently convey a tidy, clean and environmentally friendly appearance which meet the quality demands of the working environment?

In many cases the benchtops are subjected to conditions which, although these do not damage their surface, nevertheless change and affect them considerably. Various types of chemicals, hot containers or crucibles from laboratory kilns and sharp-edged tools cause clear negative impacts. Apart from the negative visual effect, it becomes more difficult to clean the changed surface and residues adhere on the surface.

FRIDURIT laboratory benchtops and sinks have been used in various laboratory applications for many years and withstand even the most aggressive attacks unscathed – the work surface remains 'like new'.

The easy to clean, scratch-resistant sealed surface of FRIDURIT laboratory benchtops also tolerates harsh cleaning procedures without being effected. The surface remains free of wear even after many years of intensive use.

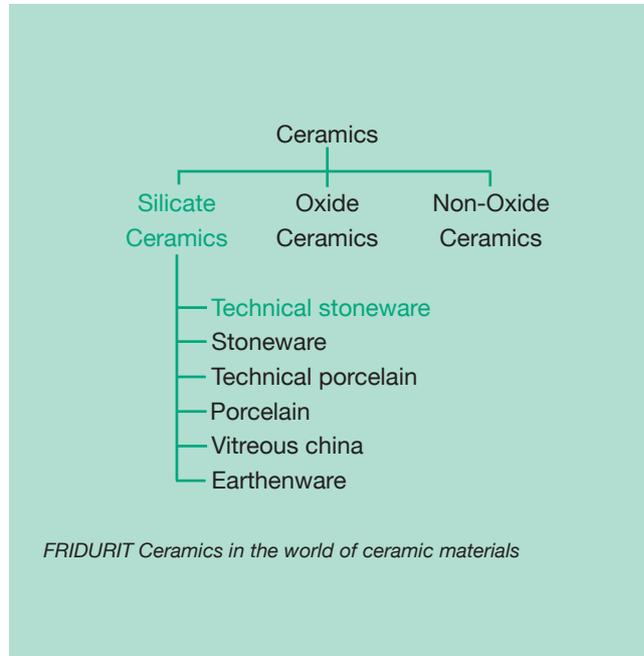
Why settle for other benchtop materials, when FRIDURIT ceramics can eliminate, stains, discolorations, scratches, loss of brilliance and other imperfections?

What Properties distinguish FRIDURIT Ceramics?

Material

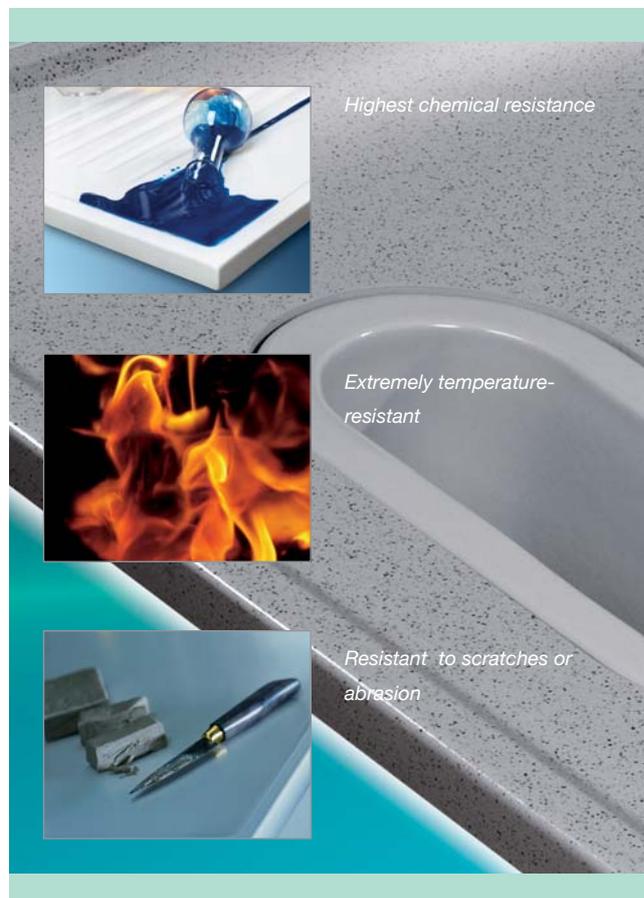
Benchtops and sinks made of FRIDURIT Technical Ceramics consist entirely of natural materials from the earth, specifically clay, kaolin and feldspar. A ceramic formulation optimized over many years has resulted in material properties whose resistance and durability meet the critical demands of laboratory routine.

Ceramic materials are used in a wide range of applications: From dishware and floor tiles to high-temperature ceramics in aerospace. FRIDURIT Technical Ceramics products belong to the group of technical stoneware whose use has been orientated to chemical-technical applications since the infancy of the chemical industry. For more than one hundred years, FRIATEC AG has been concentrating on products for industry and research which can withstand the challenging environments of the workplace today.

**Properties**

In contrast to most other materials, FRIDURIT Ceramics products with their permanently sealed surfaces offer a unique combination of chemical, temperature, scratch and abrasion resistance. With this material profile laboratory operators can create a perfect working environment:

- Material stability even when subjected to concentrated chemicals and higher temperatures for extended periods
- Easy cleaning without material effects even after heavy contamination
- Easy cleaning even after extreme stain-forming agents
- Material stability even after contact with very hot objects and open flames
- Resistance from scratch or abrasion marks caused by device handling or cleaning
- Compliance with high hygiene standards thanks to permanently sealed surfaces
- Ease of decontamination when handling radioactive substances



User-friendly design



FRIDURIT laboratory benchtops and sinks



FRIDURIT laboratory benchtop with integrated marine edge



Laboratory benchtop with bonded marine edge

Customer-specific solutions

Numerous design options for the specific benchtop and sink design with FRIDURIT Ceramics, enable the laboratory to satisfy individual laboratory requirements as needed.

Protection against liquid overflow is often appropriate or even prescribed by law for many laboratory work stations. This protection is typically provided by marine edges at the outer contour of the benchtop which are usually affixed by bonding. When designing with non-ceramic materials, a sharp-edged transition with joints is created between the benchtop and the marine edge. This is difficult to clean completely and provides starting points for surface damage. Cleanliness and hygiene standards are then difficult to meet.

FRIDURIT laboratory benchtops are produced with an integrated marine edge. The marine edge and benchtop surface are adapted without any joints. This design optimizes cleaning without risk of any damage to the surface.

FRIDURIT laboratory benchtops can, of course, also be produced without marine edges.

Groups of benchtops in combination with other materials are designed to individual requirements of planners and users. Individual benchtops may have a length of up to two meters.

All benchtops are self-supporting, i.e. they do not require any additional substructure but can be directly placed on the furniture frame. Supports at four positions is typically sufficient.

Depending on the situation in the laboratory, FRIDURIT laboratory sinks can be mounted as sit-on, underfixed or flush-mounted sinks.

Why not put FRIDURIT Technical Ceramics to the test? Test the resilience of our laboratory benchtops and sinks in advance, before they are installed in your laboratory. You can then be 100 percent certain that our products will meet your needs and surpass our promises.

Physical properties

Property	Measured value	Norm	Result
Raw density	2,37 g/cm ³	DIN EN 993-1	
Weight	26 mm 65 kg/m ²		
benchtops	20 mm 50 kg/m ²		
Thermal conductivity	1,57 W/mK	DIN EN 821-2	
Breaking load (P) in kg	26 mm P = 1600 x B/L		
benchtops	20 mm P = 1000 x B/L		
Behaviour in fire	Building material class A1	DIN EN 13501-1 DIN 4102	non combustible, no thermal load

Mechanical properties

Property	Measured value	Norm	Result
Cold compression strength	159 MPa	DIN EN 993-5	
Bending strength	41,3 MPa	DIN EN 993-6	
Static modulus of elasticity	39,0 GPa	DIN EN 993-6	
Wear	8,5 cm ³ /50 cm ²	DIN 52108	
Abrasive hardness	7	DIN EN 101	
Crazing resistance		DIN EN ISO 10545-11	no crazing

Thermal properties

Property	Measured value	Norm	Result
Thermal expansion	(α_{25-400}) 5,6 10 ⁻⁶ K ⁻¹ (α_{25-800}) 5,9 10 ⁻⁶ K ⁻¹ ($\alpha_{25-1200}$) 6,3 10 ⁻⁶ K ⁻¹	DIN 51045-2	
Application temperature	up to 550°C, temporary exposure up to 800°C		

Chemical resistance

Property	Measured value	Norm	Result
Resistance to testing solutions (e.g. solution of hydrochloric acid and sodium hypochloride)	Test samples made of FRIDURIT Technical Ceramics are exposed to testing solutions. The samples are examined visually after a specific period of time.	DIN EN ISO 10545-13	None of the testing solutions affect the test samples
Resistance to staining (e.g. iodine)		DIN EN ISO 10545-14	Solutions can be completely removed with water

Optical properties

Silk finish surface in the current glaze colors. Other colors are available to special order.
Color samples on request.

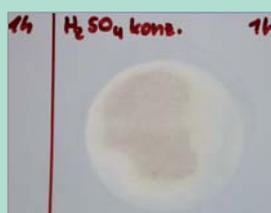
Properties



Filter paper saturated with the reagent was placed on the materials to be tested and covered with a Petri dish. Exposure took place under constant conditions.



Example of formation of stains caused by H_2SO_4 on a surface with insufficient chemical resistance.



Chemical resistance

Many years of experience in technical requirements from chemical apparatus engineering has given FRIATEC AG the knowledge in material solutions which withstand even the most extreme conditions. FRIDURIT laboratory benchtops have been proven in practice for more than 40 years and demonstrate their resistance in laboratories all over the world.

Tests have been performed on FRIDURIT which assess the chemical resistance of benchtop materials as recommended by SEFA (Scientific Equipment and Furniture Association). These tests subject laboratory benchtops to a 24-hour contact with a reagent and classify the results as follows: “No effect – slight changes in color and brilliance – slight etching of the surface or clear formation of stains – corrosion, localized corrosion or etching of the surface”.

Many benchtop materials already show clear changes when subjected to common laboratory chemicals and cause an unclean and unsightly look. With the exception of hydrofluoric acid, FRIDURIT Technical Ceramics prevent formation of stains or loss of brilliance and thus help to maintain perfect surfaces. The table below lists some examples of the material's efficiency.

	0	1	2	3
Hydrochloric acid (48%)	■			●
Nitric acid (30%)	■	●		
Nitric acid (65% und 70%)	■		●	
Sulphuric acid (98%)	■	●		
Sulphuric acid (77%) : Nitric acid (70%)	■		●	
Sulphuric acid (85%) : Nitric acid (70%)	■		●	
Iodine (crystal)	■	●		
Iodine solution (0.1 N)	■	●		
Furfural	■	●		

■ FRIDURIT Ceramics

● various resin based benchtop materials

0 - no effect

1 - slight changes in color and brilliance

2 - slight etching of the surface or clear formation of stains

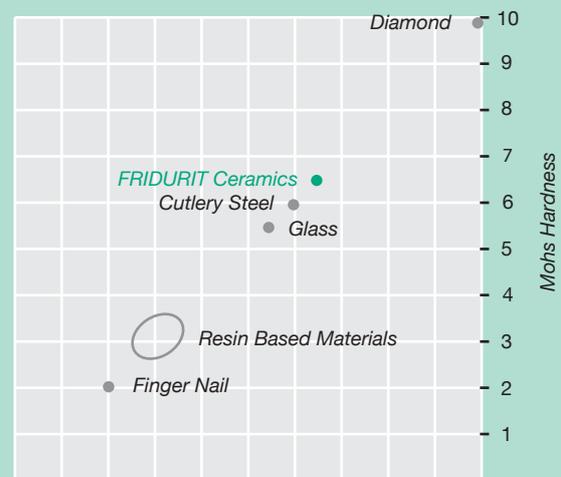
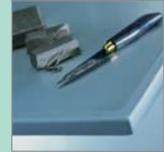
3 - corrosion, localized corrosion or etching of the surface

Scratch abrasion resistance

An outstanding property of ceramic materials is their hardness. There are various methods to determine the hardness of a material (e.g. Rockwell, Brinell, Vickers, Knoop). However, the question arises to what extent such hardness values can be used when assessing the scratch resistance of benchtops.

One method, which classifies the scratch resistance of various materials in an easy-to-understand way is the Mohs test. This test assesses whether a material's surface prevents scratch marks when scratched in a defined way across the surface with another material of known hardness when applying corresponding pressure.

In this scale, the diamond is the hardest material, has a Mohs hardness of 10 and scratches all materials having smaller hardness values. Common cutlery steel for example has the Mohs hardness 6 and cannot scratch FRIDURIT Technical Ceramics. The hardness of FRIDURIT Technical Ceramics ranges between 6 and 7.



Mohs Hardness Scale

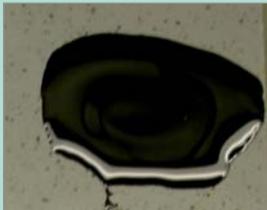
Properties



Effect of high temperature object on resin based material

Temperature resistance

Another outstanding property of ceramic materials is their temperature resistance. Produced in a sintering process at temperatures exceeding 1,200°C, FRIDURIT Technical Ceramics products withstand contact with hot objects which exceed 800°C without damage. The example on the left shows effects resulting from insufficient resistance. FRIDURIT Technical Ceramics products withstand temperatures of up to 800°C. Contact with open flames, for example a Bunsen burner, does no damage to the surface.



Heavy contaminations by bitumen and fuchsine can be removed without traces from FRIDURIT laboratory benchtops

Easy cleaning

Cleaning of benchtops in laboratories can result in extreme stresses for the surface, in particular if these contaminations are difficult to remove. Most materials rarely survive such procedures in an undamaged condition. The hardness and the related scratch resistance of FRIDURIT Technical Ceramics permit even the harshest cleaning methods. The benchtop remains unchanged.



Hygiene

A smooth, impenetrable surface without scratches or abrasions, guarantees hygienic conditions. Bacteria or other microorganisms find no opportunities to penetrate or grow. The optimal cleaning capability prevents sources of "food" to remain on the surface.

Ease of decontamination

The permanently maintainable sealed structure of the surface is a decisive criterion for laboratory users working with radioactive substances. Here, conditions have to be created which reliably and safely guarantee decontamination.

FRIDURIT Technical Ceramics products are used in institutes where radioactivity must be defined (State Office for Environmental and Radiation Protection). Such measurements may not be impaired by changing radiation conditions in the working environment.

FRIDURIT Technical Ceramics products ensure that full decontamination is possible at any time after any exposure or experiment.

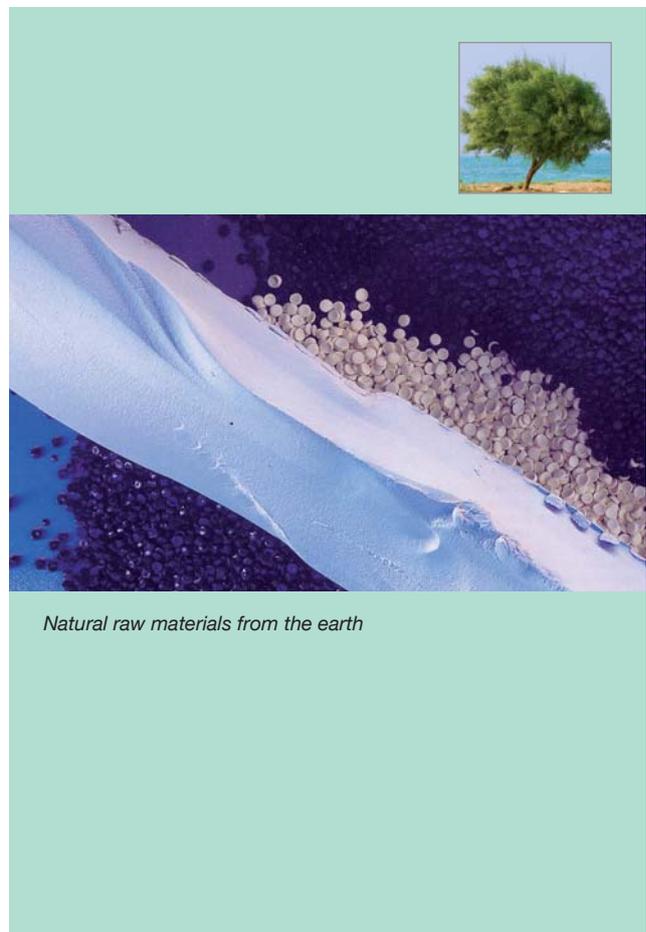


Environmental compatibility

FRIDURIT is produced solely from natural, and recyclable materials from the earth such as clay, kaolin and feldspar. Materials without chemical substances can be recycled without difficulty, either during the production process or when disposing after several years of use in laboratories.

FRIDURIT Technical Ceramics products are representative of 'green' building materials which are an important element when implementing 'green building' concepts. These concepts (e.g. LEED, BREEAM) increase the resource efficiency of buildings while at the same time reducing negative effects on health and the environment. The user of the laboratory works on fully zero-emission benchtops which offer safety in every respect. FRIDURIT Technical Ceramics products are inflammable (Fire Protection Classification A1) and do not increase the fire load in buildings.

The production process of FRIDURIT Technical Ceramics products complies with the ISO standards for general process management (ISO 9001:2000 et seq.) as well as for the compliance of environmentally relevant considerations (ISO 14001). Sustainable development and fitness for the future is a maxim of the use of FRIDURIT Laboratory Technology.



Natural raw materials from the earth

■ ■ ■ FRIDURIT® system solutions

Safety and competence for successful laboratory projects

FRIDURIT®



FRIDURIT® laboratory benchtops and sinks

■ made of Technical Ceramics

Highest resistance to virtually all chemicals commonly used in the laboratory. Low-maintenance and reliable due to scratch and abrasion proof surface. Non combustible and 100 % recyclable.

■ made of Polypropylene

Resistant to breakage, welded with no joints and easy to clean.



FRIDURIT® Fume scrubber

Absorbs inorganic contaminants in the waste air from the laboratory fumehood.

FRIDURIT® Neutraliser unit

For safe neutralisation of laboratory effluent. Fully automatic, quiet and reliable.

FRIDURIT is a registered brand of FRIATEC AG.