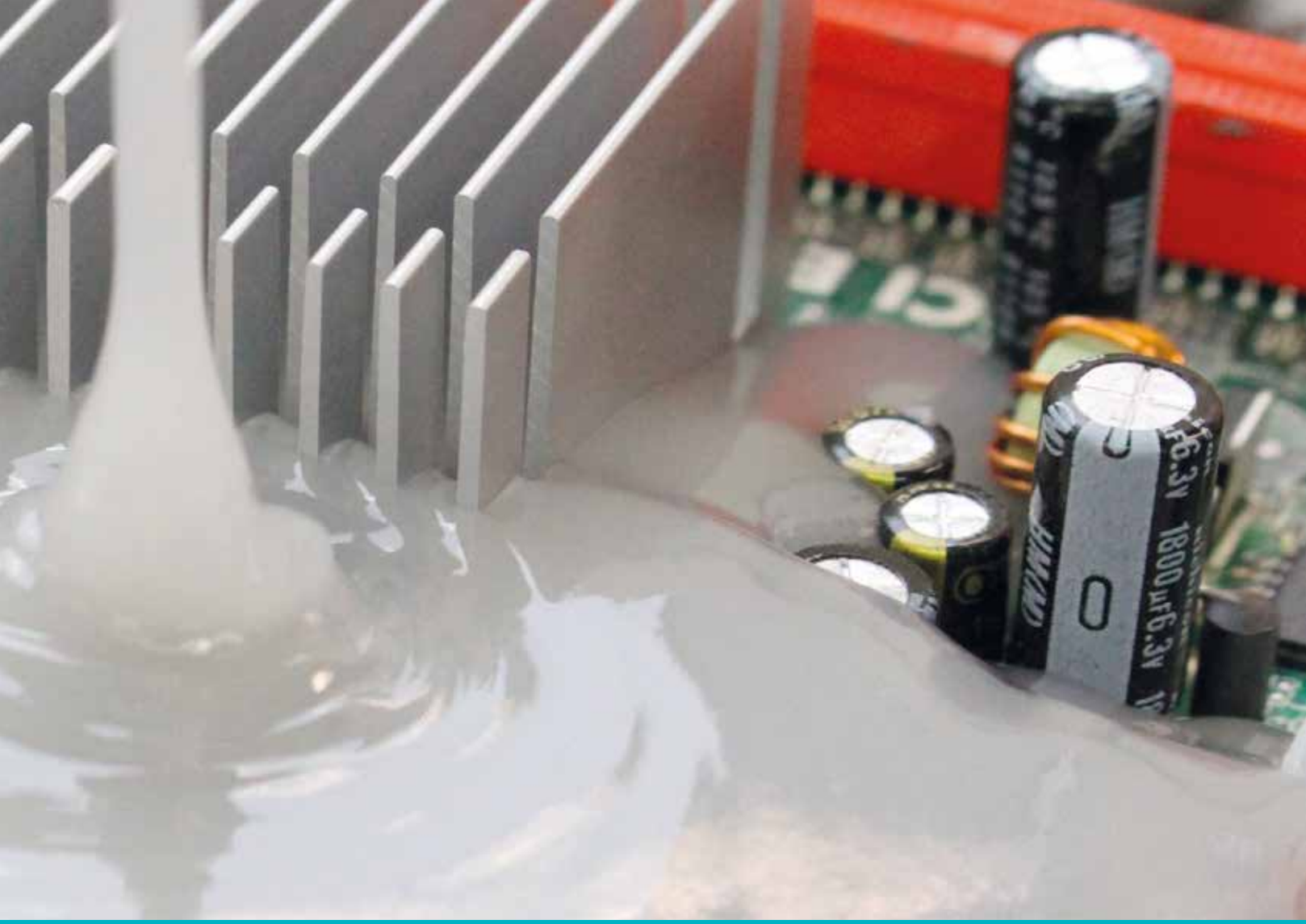


E&E

电气和电子应用

Electrical and Electronic Applications

Hidden inside – Performance outside!

HPF **Minerals Ltd.**

A SUBSIDIARY OF THE QUARZWERKE GROUP

我们能为您的填料问题提供解决方案

Quarzwerke 集团是一家独立的家族企业，在工业矿物的提取、加工和精炼方面拥近140年的历史。

HPF The Mineral Engineers 部门在矿物学和合成的基础上，开发创新功能型高性能填料和添加剂，来帮助客户创建独特的系统解决方案。在这个过程中，我们与客户的开发部门紧密合作。凭借我们的经验和设备，我们能够在以下领域为客户进行配方前期开发：

- 油漆和涂料
- 建筑化学
- 塑料
- 粘合剂

我们专注于聚合物应用和复合物产品，帮助全球客户获得成本效益。

We develop the answers to your filler questions

The Quarzwerke group is an independent family business with almost 140 years of tradition in the extraction, processing and refining of industrial minerals.

The division HPF The Mineral Engineers helps to create unique system solutions by developing innovative and functional high-performance fillers and additives on a mineralogical and synthetic basis. To achieve this, we work hand in hand with the development departments of our customers. Thanks to our experience and equipment we are in a position to be able to perform predevelopment work on model formulations for our customers in the sectors

- *paints & laquers*
- *construction chemicals*
- *plastics*
- *adhesives*

With our focus on polymer applications and composite products we help our customers worldwide to ensure productivity

MILLISIL®，SIKRON®
SILBOND® 硅烷化
SILMIKRON®
石英

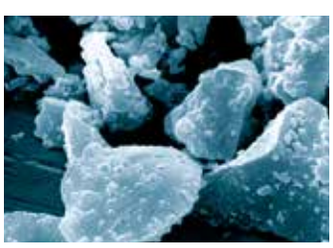
- SiO_2
- 密度 2.65 g/cm³
- 硬度 7（莫氏）
- 高耐化学性
- 热膨胀系数：14*10⁻⁶/K
  （在 20-300°C 的温度下）
- 导热率：9 W/mK
- 良好的电绝缘性能
  （低 tanδ）
- 有棱角的颗粒

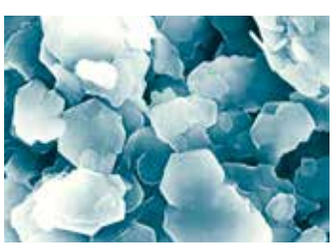
SILBOND® 硅烷化
熔融石英

- SiO_2
- 密度 2.2 g/cm³
- 硬度 6.5（莫氏）
- 化学惰性
- 热膨胀系数
  0.5*10⁻⁶/K
  （在 20-300°C 的温度下）

Chinafill
高岭土 TEC，CALK
高岭土

- $Al_2SI_2O_5$
- 密度 2.6 g/cm³
- 硬度 2（莫氏）
- 热膨胀系数
  5*10⁻⁶/K
  （在 20-300°C 的温度下）
- 阻燃





MILLISIL®, SIKRON®
SILBOND® silanised
SILMIKRON®
silica

- *SiO_2*
- *density 2.65 g/cm³*
- *hardness 7 (Mohs)*
- *high chemical resistance*
- *thermal expansion*
  *14*10⁻⁶/K (at T 20-300°C)*
- *thermal conductivity: 9 W/mK*
- *good electrical properties*
  (low tan delta)
- *square edge particles*

SILBOND®silanised
fused silica

- *SiO_2*
- *density 2.2 g/cm³*
- *hardness 6.5 (Mohs)*
- *chemically inert*
- *thermal expansion*
  *0.5*10⁻⁶/K (at T 20-300°C)*

Chinafill
Kaolin TEC, CALK
kaolin

- *$Al_2SI_2O_5$*
- *density 2.6 g/cm³*
- *hardness 2 (Mohs)*
- *thermal expansion*
  *5*10⁻⁶/K (at T 20-300°C)*
- *flame retardant*

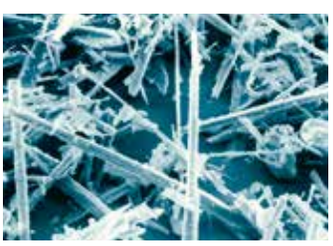
TREMIN® 283
TREMIN® 939
硅灰石

- $CaSiO_3$
- 密度 2.85 g/cm³
- 硬度 4.5（莫氏）
- 热膨胀系数：6*10⁻⁶/K
  （在 20-300°C 的温度下）
- 亮度
  （Y 颜色值 > 90）

- TREMIN® 283
  产品：块状颗粒
  （长度/直径 3:1）低长径比
- TREMIN® 939
  产品：针状颗粒
  （长度/直径 8:1）高长径比
- 优异的补强性能

HYDRAFIL®
氢氧化铝

- $Al(OH)_3$
- 密度 2.4 g/cm³
- 硬度 3（莫氏）
- 化学惰性
- 热膨胀系数
  15*10⁻⁶/K
  （在 20-300°C 的温度下）
- 亮度（Y 颜色值 > 94）
- 阻燃



TREMIN® 283
TREMIN® 939
wollastonite

- *$CaSiO_3$*
- *density 2.85 g/cm³*
- *hardness 4.5 (Mohs)*
- *thermal expansion*
  *6*10⁻⁶/K (at T 20-300°C)*
- *brightness*
  (Y-value > 90)

- *TREMIN® 283 products*
  granular particles
  (aspect ratio 3:1) LAR
- *TREMIN® 939 products*
  acicular particles
  (aspect ratio 8:1) HAR
- *excellent reinforcing properties*

HYDRAFIL®
aluminium hydroxide

- *$Al(OH)_3$*
- *density 2.4 g/cm³*
- *hardness 3 (Mohs)*
- *chemically inert*
- *thermal expansion*
  *15*10⁻⁶/K (at T 20-300°C)*
- *brightness (Y-value >94)*
- *flame retardant*

SILATHERM®
导热、电绝缘填料

- 密度 3.6 g/cm³
- 硬度 5（莫氏）
- 化学惰性
- 热膨胀系数
  $7*10^{-6}$/K
  （在 20-300°C 的温度下）
- 导热率
  14 W/mK
- 耐热

SILATHERM® Plus

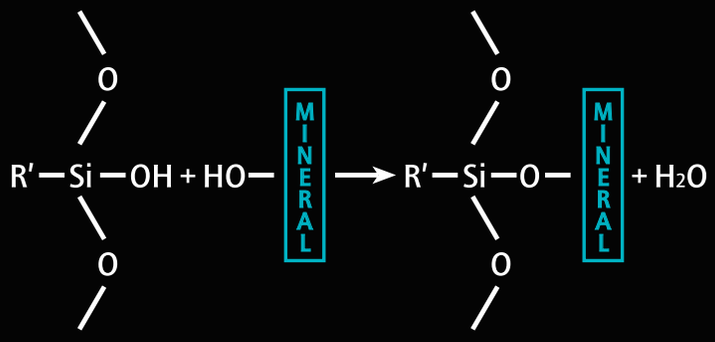
- 密度 4,0 g/cm³
- 硬度 9（莫氏）
- 化学惰性
- 热膨胀系数
  $7.3*10^{-6}$/K
  （在 20-300°C 的温度下）
- 导热率
  30 W/mK

SILATHERM®
thermally conductive, electrically insulative fillers

SILATHERM® Plus

- *density 3.6 g/cm³*
- *hardness 5 (Mohs)*
- *chemically inert*
- *thermal expansion*
  $7*10^{-6}$/K (at T 20-300°C)
- *thermal conductivity*
  14 W/mK
- *heat resistant*

- *density 4.0 g/cm³*
- *hardness 9 (Mohs)*
- *chemically inert*
- *thermal expansion*
  $7.3*10^{-6}$/K (at T 20-300°C)
- *thermal conductivity*
  30 W/mK



矿物表面的硅烷化反应
Silan reaction at the surface of the mineral

一段时间以来，填料已不仅仅是一种低成本的聚合物填充料。它们的使用可以有针对性地调节聚合物体系的性质， 使其满足特殊的要求。
填料和聚合物基质之间的界面对于体系的最终性能至关重要。如果聚合物和填料不匹配，则会削弱整个体系的性能。经过硅烷化处理的填料可以最佳地融合到聚合物基质中。
经过表面修饰的填料比未修饰填料更容易掺入到聚合物中。聚合物和高性能填料之间的最佳效果通过针对聚合物体系的填料表面硅烷化来实现。

For some time now, fillers have been far more than just inexpensive filling materials for polymers. By using them, the properties of the polymer system can be specifically modified and adapted to special requirements.
The interfaces of the polymer matrix and the filler influence the final properties of the system vitally. If the polymer and the filler do not harmonise, the whole system is weakened. The optimal integration of a filler into the polymer system is achieved by silanization.
It is easier to incorporate coated fillers into a polymer than uncoated ones. To achieve an optimum chemical bond between the polymer and the functional filler, a silane specially adapted to the polymer system must be applied to the surface of the filler.

矿物填料的硅烷化处理

通过根据各种应用对矿物填料进行有针对性的表面改性，可以在聚合物体系或最终零件中实现以下性能：

- 高耐候性和耐化学性
- 高机械强度
- 更高的杨氏模量
- 更高的填充度
- 优异的可加工性

关于何种表面修饰能为某种聚合物提供最佳结果的问题，最可靠的是通过实验获得答案。

Silanisation of mineral fillers

With a specific surface treatment of mineral fillers, attuned to the polymer system, the following features are achieved:

- *high weathering and chemical resistance*
- *high mechanical strengths*
- *increased tensile modulus*
- *enhanced filling degree*
- *excellent processability*

The most reliable way to find out which coating produces the best results for a specific polymer is by experiment.

应用推荐 | *Recommended application*

聚合物体系 *polymer systems*	产品标识 *labelling*
EP, EPDM, FA, MF, PA, PC, PE, PF, PP, PUR, PVC, UF, 聚砜 | *polysulfone*, 水性分散体系 | *aqueous dispersions*	- AST
ABS, EP, MF, UP, SAN, PA, PC, PE, PF, PP, PS, PUR, PVC, 醇酸树脂 | *alkyd resins*, 聚硫 | *polysulfide*, 水稀释的体系 | *water-dilutable systems*	- EST
EP, PE, PMMA, PP, PS, SAN, UP	- MST
硅橡胶 | *silicone rubber*	- RST
硅橡胶 | *silicone rubber*	- TST
UP, PDAP, PP, PE, EPDM, EPM, SBR, EPT	- VST

电气和电子设备在我们的技术和数字生活中扮演着非常重要的角色。人们对电气性能和机械强度的要求越来越高。随着电子组件的小型化发展趋势，制造商还面临着全新的挑战。矿物高性能填料可以对某些性能产生重大影响。

Electrical and electronic applications play a very important role in our increasingly technological and digital everyday life. The demands on electrical power and mechanical strength are increasing. As electronic components get smaller and smaller, there are also new challenges that need to be addressed. Mineral high-performance fillers can make a major contribution to influencing certain properties.

用于电气工程的环氧树脂
Epoxy resins for electronic engineering

环氧树脂具有良好的粘附强度、耐热性和耐化学性以及出色的电气性能，在电气工程的原材料中起着重要的作用。在电气应用中，环氧树脂模塑材料可用于涂料体系，用于化合物的层压树脂和印刷电路板的生产。在电气工程中，环氧树脂可用于制造转换器、绝缘子和干式变压器。所选的功能性填料会显著影响环氧树脂所需的机械、热和电气性能。

Epoxy resins play an important role as raw material for electrical and electronic engineering due to the good adhesive strength, the heat and chemical resistance as well as the excellent electrical properties. In electrical applications epoxy resin moulding materials are used for coating systems, as lamination resins for connections and for the production of circuit boards. Epoxy resins are used in electrical engineering for the construction of transducer, insulator devices and dry-type power transformer. The required mechanical, thermal and electrical characteristics of the epoxy resin are affected significantly by the choosen functional filler.

对于热固性模制零件，良好的工作温度、电气性能和机械强度等特性至关重要。由于中压技术的要求差异很大，因此为生产热固性材料选择合适的填料非常重要。由于要求的不同，并不是只有“唯一的”最佳填料。

Ever greater requirements are being made of moulded parts with respect to the usage temperatures, electrical powers and electrical strengths, which is why improved moulding material properties are required. The selection of suitable fillers is of outstanding importance in the manufacture of epoxy compounds for use in medium high-voltage technology. As the requirements differ greatly, it is not a case of there being just "one" optimal filler.

用于电气工程的高性能填料
High Performance Fillers for electrical engineering

通过对填料的表面处理， 组件可以无故障的使用多年， 即使是室外应用。另外， 使用表面处理的填料可以获得外观更好、机械学和电气性能更高的最终零件。
我们最近开发的一些填料具有非常特定的粒径分布，可以在相同填料含量的情况下降低加工粘度。另一方面，增加填料含量可对抗裂性产生积极的影响。

矿物填料在环氧浇铸树脂中的优势：

- 控制铸造过程中的热量
- 实现良好的机械性能
- 混合物的热膨胀较低
- 电损耗低（tan δ）
- 高成本效益的配方

Due to the silanisation of our fillers the components can perform their service without any difficulty over a period of many years, even outdoors. In addition, the use of silanised fillers leads to optically sophisticated, mechanically and electrically more resistant finished parts.

Our latest product developments show very special grain size distributions. Therefore they enable lower processing viscosities by maintaining the same filling degree. On the other side a higher filling degree can influence the crack sensitivity positively.

Advantages of mineral fillers in epoxy casting resins:

- *thermal control during the casting process*
- *to obtain good mechanical properties*
- *low thermal expansion of the mixture*
- *low electrical loss (tan δ)*
- *cost-effective formulation*


HPF Minerals Ltd.

MILLISIL®
用于室内应用

几十年来，石英粉被广泛用于环氧树脂应用中。以 MILLISIL® W 12 为例，它具有以下特性：

- 有棱角的颗粒
- 耐候性和耐化学性
- 低热膨胀系数：$14*10^{-6}/K$
  （在 20-300°C 的温度下）
- 良好的电绝缘性能（低 tan δ）

MILLISIL®
for indoor applications

For decades silica flours are established in epoxy resins applications.Our MILLISIL® W 12 for example is characterised by

- *angular particles*
- *weathering and chemical resistance*
- *low coefficient of thermal expansion: $14*10^{-6}/K$ (at a temperature of 20 – 300°C)*
- *good electrical insulating properties (low tan delta)*

SILBOND® W 12 EST
用于耐候性应用

由表面处理的石英粉填充的环氧树脂具有出色的机械学性能和优良的加工性能，长期以来是用于室外耐候性应用的良好选择。如今，SILBOND® 石英粉被越来越多地用于室内应用的浇铸树脂零件，因为它们能够生产具有高光泽、高质量表面的产品。除了上述优点外，该系列还具有以下优点：

- 高耐候性和耐化学性
- 高机械强度
- 更高的填充度
- 优异的可加工性
- 低热膨胀

SILBOND® W 12 EST
for weather-resistant application

Weathering resistant outdoor applications are long since standard purposes for surface treated silica flour due to the outstanding mechanical and chemical processability into the epoxy polymere systems. SILBOND® silica flour is nowadays increasingly applied as well in indoors casting resin parts, as for products with high glossy, top-quality surfaces. In addition to the already mentioned advantages the surface-treated version offers:

- *high weathering and chemical resistance*
- *high mechanical strength*
- *increased filling degrees*
- *excellent processability*
- *low thermal expansion*

SILBOND® 126 EST
用于最高填充度和恒定粘度

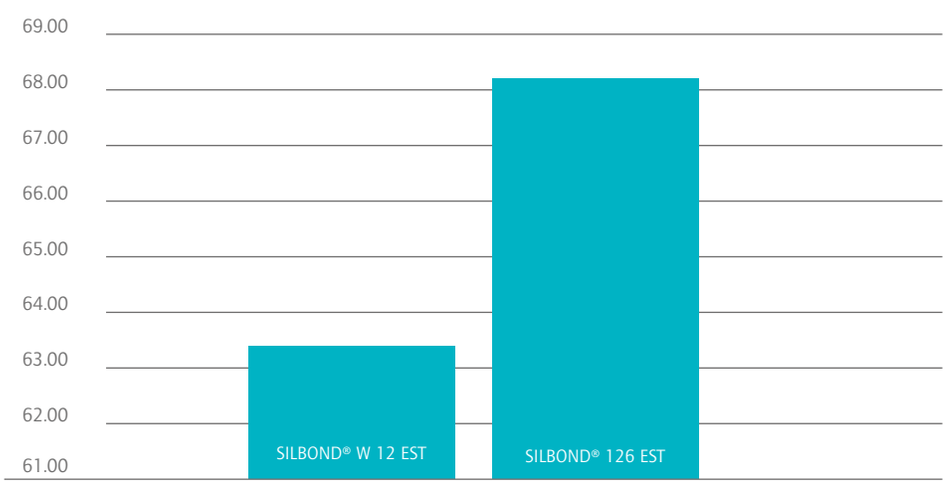
SILBOND® 126 EST 是成熟的表面处理型石英粉 W 12 EST 和 SILBOND® W 6 EST 的改进版本。由于优化了粒径分布，SILBOND® 126 EST 在恒定的粘度下具有更高的填充度。

SILBOND® 126 EST for highest filling degrees and constant viscosity

SILBOND® 126 EST is an advancement of the already established surface treated silica flours W 12 EST and SILBOND® W 6 EST. Due to the optimised particle size distribution SILBOND® 126 EST features an increased filling degree at constant viscosity.

在环氧树脂化合物中的填充度 [重量 %]（目标粘度：2000mP*s）

*Filling degree [mass%] of epoxy resin compounds (target viscosity 2000 mP*s)*



HPF Minerals Ltd.

SILBOND® 熔融石英
用于变温环境的环氧树脂体系

环氧树脂材料和金属材料受到很大的热交变应力。温度波动会引起材料尺寸的变化。为了避免损坏组件，不同材料的尺寸偏差必须尽可能相同。通过在材料中使用具有低热膨胀系数的熔融石英，可以最大程度地减少铸件和金属之间因温度引起的不同尺寸变化。这样可以生产复杂的零件并防止开裂。

对于更高的填充度，我们提供了粒径优化型 SILBOND® FW 126 EST。

SILBOND® fused silica for epoxy systems with strong variation in temperature

The epoxy compound and the metallic material are exposed to strong thermal alternating stress. Thermal fluctuations cause changes in material dimensions.In order to avoid damages at the devices the dimension discrepancies of the different material must be minimised. In order to minimise the different changes in dimension of the compound and the metal, fused silica with a low thermal coefficient of expansion is applied. Thus crack sensible applications as big metallic casting parts or complex geometric shapes can be produced.

For higher filling degrees we offer the grain size optimised product SILBOND® FW 126 EST.

低热膨胀
Low thermal expansion

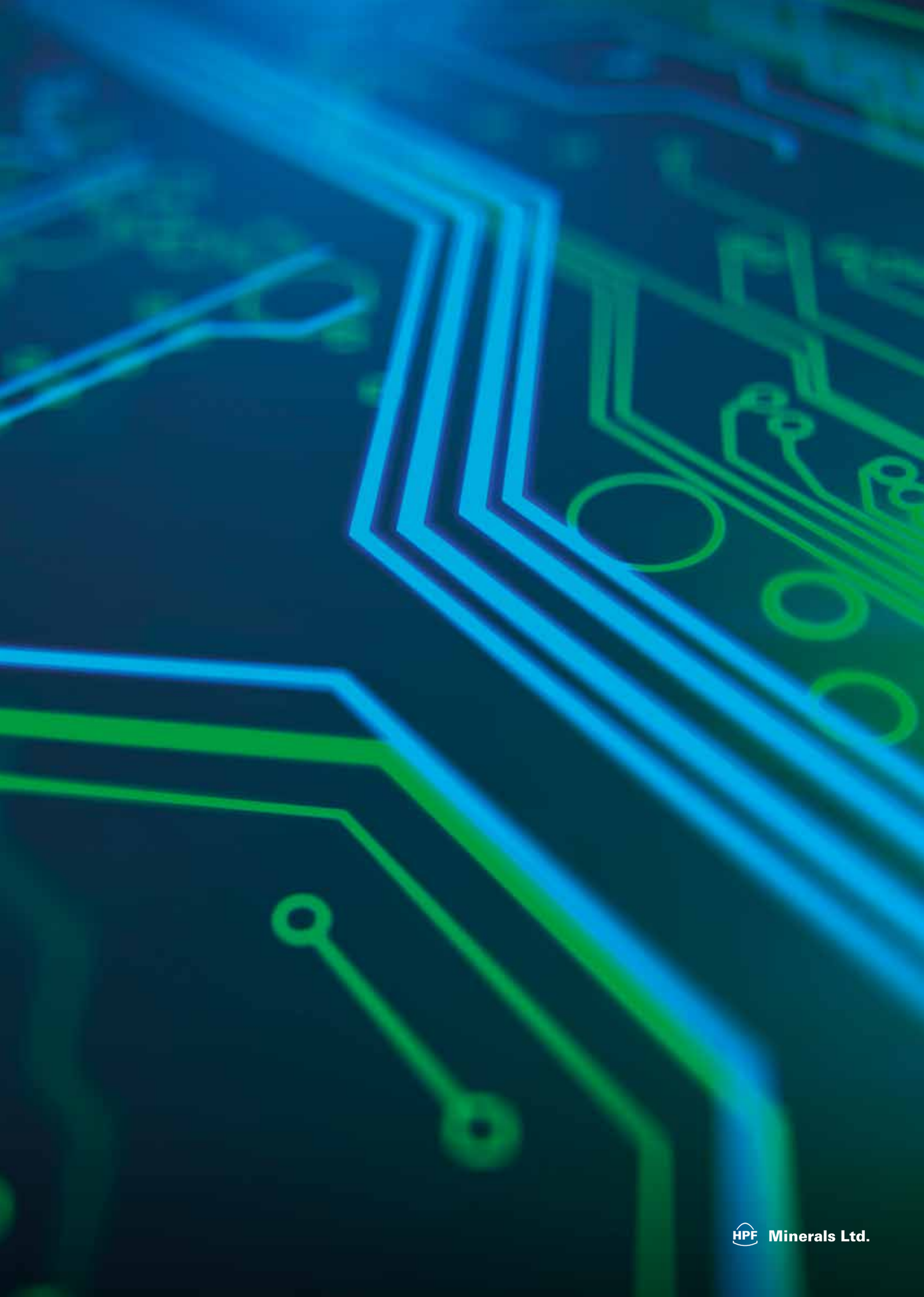
选定填料的热膨胀系数

Thermal expansion of choosen fillers in details

产品 | *product*	填充度 | *filling degree* (2000 mPa*s / 60°C) [重量 % | *mass %*]	填充度 | *filler loading* (2000 mPa*s / 60 °C) [体积 %]	热膨胀系数	
			CTE 填料（文献） *filler (literature)*	CTE 化合物 (测量值 | *measured)*
EP 树脂 (CY 184/HY 1235)	0	0	–	70
MILLISIL® W 12	62.7	43	14	36
SILBOND® W 12 EST	63.4	44	14	36
SILBOND® 126 EST	68.2	48	14	31
SILBOND® FW 12 EST	59.0	44	0.5	29

熔融石英的突出特性是其极低的热膨胀系数。这对于高级电气工程应用中的EP材料至关重要。

The outstandig feature of fused silica is its outstanding low thermal coefficient of expansion which is indispensable for epoxy resin systems for top-quality electrical applications.



HPF Minerals Ltd.

TREMIN® 硅灰石
用于易裂型应用

不管是块状还是针状的 TREMIN® 硅灰石都具有以下特性：

- 良好的电学特性
- 低热膨胀
- 很好的补强性能

硅烷化填料的特点是其刚性比未经表面处理的填料高。
具有优异抗冲击性的 TREMIN® 283-100 EST 建议用于室内应用。

TREMIN® wollastonite
for crack sensitive applications

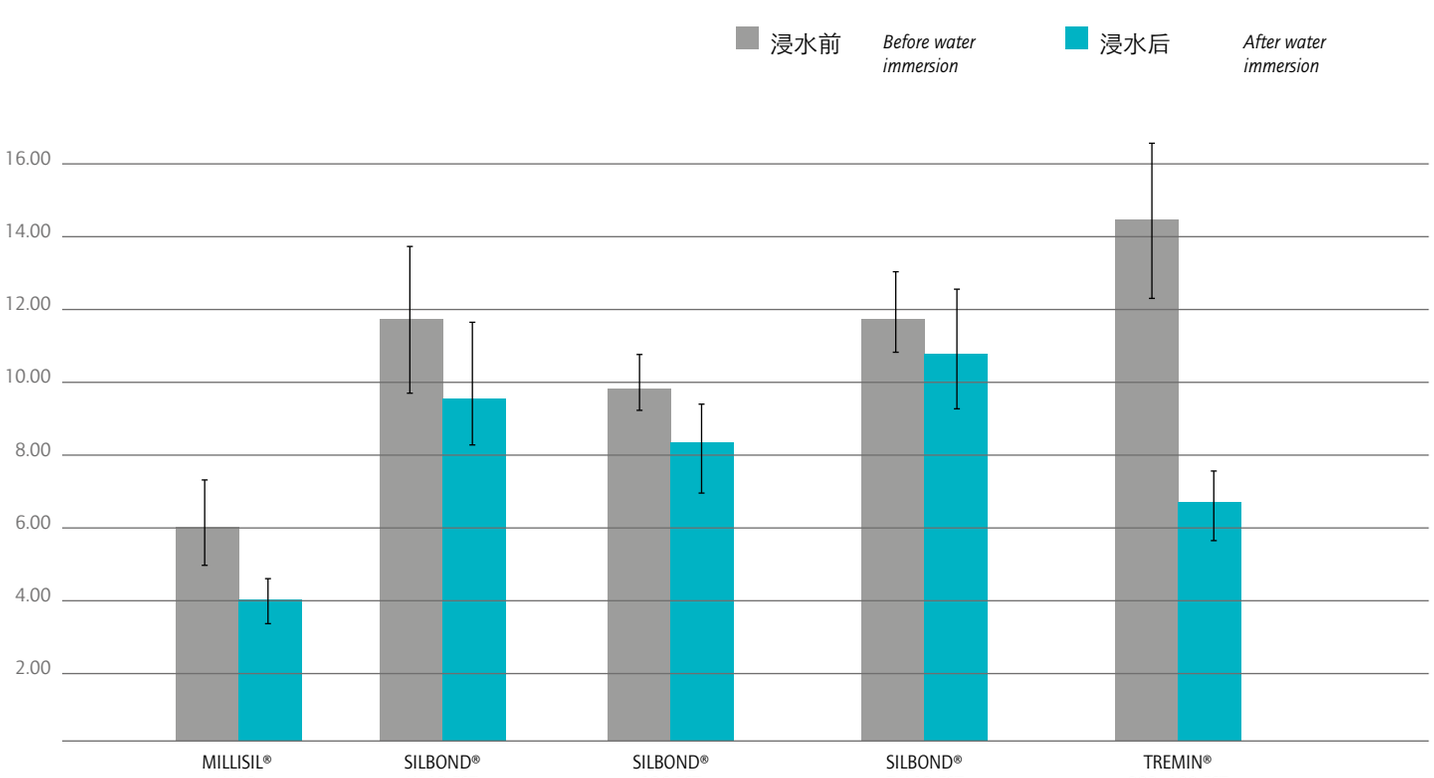
TREMIN® wollastonite, either block-like or acicular, features the following characteristics:

- *good electrical properties*
- *low thermal expansion*
- *very good reinforcing properties*

The silanised fillers are all characterised by a better degree of rigidity than those that are not surface treated. TREMIN® 283-100 EST with an excellent impact resistance is recommended for indoor applications.

环氧树脂复合物的抗冲击强度
[kJ/m²] (Charpy)

Impact resistance [kJ/m²] (Charpy)
of epoxy resin compounds



HYDRAFIL® 744 氢氧化铝：白色和阻燃

根据拜耳工艺，氢氧化铝由铝土矿制成。氢氧化铝具有阻燃、高白度和低硬度等突出性能。脱水从 180°C 开始。HYDRAFIL® 744 产品被广泛用于环氧树脂体系中。

HYDRAFIL® 744 aluminium hydroxide: white and flame retardant

Aluminium hydroxide is made from bauxite according to the Bayer proceeding. The outstanding features of aluminium hydroxide are flame retardance, high whiteness and low hardness. Dehydration starts at 180°C. The product HYDRAFIL® 744 is already established in epoxy resin systems.

HYDRAFIL® 744	
$Al(OH)_3$	99.9 %
Na_2O	0.1 %
Fe_2O_3	0.01 %
硬度 | *hardness (Mohs)*	3
密度 | *density*	2.4 g/cm³
亮度 | *brightness*	Y > 90
热膨胀 | *thermal expansion*	$15*10^{-6}$/K （在 20-300°C ）
pH 值 | *pH-value*	8

典型值 | *typical values*

高岭土 TEC 作为聚酰胺中的阻燃剂

高岭土是层状硅酸盐，根据矿床的不同，其或多或少呈片状结构。借助高岭土 TEC 110，我们成功开发出了一种具有出色补强性能的高长径比片状结构。通过使用经过表面处理的 TEC 110 AST 高岭土，可以显著减少阻燃剂的用量。

Kaolin TEC as flame retardant product in polyamide

China clays are phyllosilicates which have a more or less high platiness depending on the deposit. With Kaolin TEC 110 we managed to develop a particular high aspect ratio quality with excellent reinforcing properties. Through the use of the surface-treated version Kaolin TEC 110 AST the quantity of the used flame retardants can be reduced significantly.

高岭土 TEC	
SiO_2	49 %
Al_2O_3	35 %
Fe_2O_3	0.5 %
MgO	0.2 %
硬度 | *hardness (Mohs)*	2
密度 | *density*	2.6 g/cm³
亮度 | *brightness*	Y > 78
中值粒径 | *medium grain size* d_{50}	1.3 µm

典型值 | *typical values*

阻燃
flame retardance

HPF Minerals Ltd.

塑料的有效散热

导热塑料在电气和电子领域发挥着越来越重要的作用。不仅在汽车领域，在其他领域，自动化、网络和其他安全相关组件的 E&E 应用数量都在稳步增加。在大多数这些应用中，发热和散热问题对制造商构成了巨大挑战。借助树脂和填料的巧妙组合，可以开发技术上和经济上可行的替代金属的解决方案。
在 SILATHERM® 产品系列的帮助下，我们开发了一种基于矿物填料的高效解决方案，它不仅可以提高塑料的导热性，还兼具电绝缘性。

Effective thermal conductivity for plastics

Thermally conductive plastics play a still increasing role in electric and electronic. The number of E&E applications in terms of automation, interconnectedness and other security components is steadily increasing not only in the automotive sector.In most of these applications, the issue of heat generation and its effective dissipation is a major challenge. Through the smart combination of plastics and fillers technically and economically viable alternatives to metal solutions can be developed.
With the product family SILATHERM® an effective solution based on mineral fillers for improved thermal conductivity of plastics has been developed which has at the same time an insulating effect against electricity.

SILATHERM®

SILATHERM® 在环氧树脂体系中具有以下优势：

- 导热率高于 3 W/mK
- 电绝缘
- 良好的机械性能
- 化学惰性
- 耐热

为更高的填充度和更高的导热性，提供粒度优化产品。该产品特别适用于浅色或彩色部件。

SILATHERM®

SILATHERM® offers the following benefits in epoxy resins:

- *thermal conductivity higher than 3 W/mK*
- *electrical insulation*
- *good mechanical properties*
- *chemically inert*
- *heat resistant*

For higher filliing degrees and higher thermal conductivity we offer grain size optimised types. This product can be optimally used for bright or colored equipment.

SILATHERM® Plus

SILATHERM® Plus 是一种具有更优化的堆积密度的导热填料。它具有极高的填充度和出色的流动性。SILATHERM® Plus 特别适用于需要高度电绝缘和高导热性的应用。通过对体系进行特殊的表面处理，可以获得近 90% 的高填充度。

SILATHERM® Plus 在环氧树脂体系中的优势：

- 超过 4 W/m *K 的更高导热率
- 提高和优化填充度
- 低粘度
- 良好的机械性能

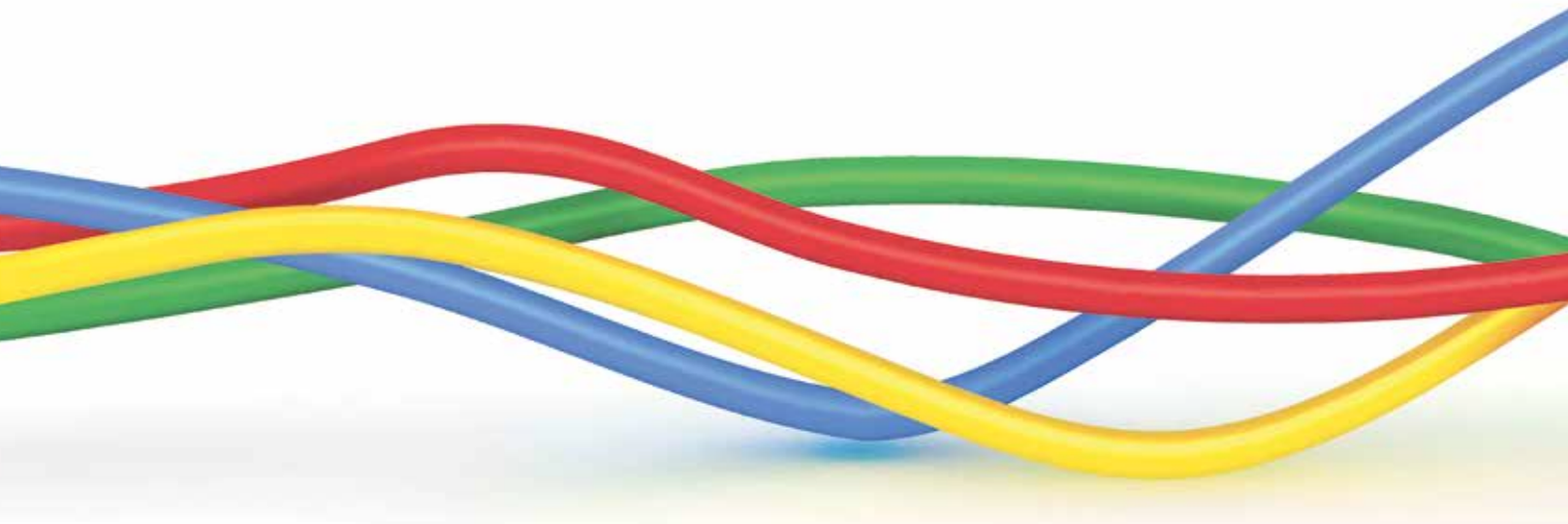
SILATHERM® Plus

SILATHERM® Plus is a range of thermally conductive fillers with optimised packing density. Very high filling degrees are combined with excellent flow properties. SILATHERM® Plus is particularly suitable for applications where electrical insulation is associated with higher thermal conductivity. With a surface treatment that is specially adapted to the polymer system, high filling levels of almost 90 % can be achieved. Advantages of SILATHERM® Plus in epoxy resins:

- *thermal conductivity higher than 4 W/m*K*
- *increased and optimised filling degree*
- *low viscosity*
- *good mechanical properties*

与其他材料一样，在开发之初必须在概念（构造和设计）中考虑、权衡和斟酌其优缺点。这样可以最佳地利用其主要优势，例如，提高的导热率、与其他填料相比对化合物机械性能的适度影响、各向同性、与塑料基质的良好键联、更高的耐热性等。

As with other materials as well, the benefits and disadvantages have to be considered at the beginning of a development process and taken into account for the whole concept (construction and design). In this way, the vast advantages such as significant increase of thermal conductivity, moderate effect on the mechanical properties of the compound compared to other fillers, isotropy, optimal bonding to the plastic matrix, increased heat resistance etc. can be utilised optimally.



可调弹性

石英资源在全球范围内分布广泛，硬度高、耐化学腐蚀，是一种多用途的天然资源。

在电缆应用中，通常使用SIKRON® SF 600和/或表面处理的SILBOND® 600 TST和SILBOND® 600 RST系列。用三甲基硅烷（-RST）处理填料可确保在硅胶的加工过程中具有低粘度。这类填料的使用可以有针对性地调节硅胶零件的电气和机械性能（例如，提高电绝缘性能）。

由 SIKRON® 和 SILBOND® 补强的有机硅聚合物具有以下特性：

- 可调节弹性和肖氏硬度
- 可调的热膨胀
- 很好的着色性
- 改善的电绝缘性能
- 更小的反应收缩率

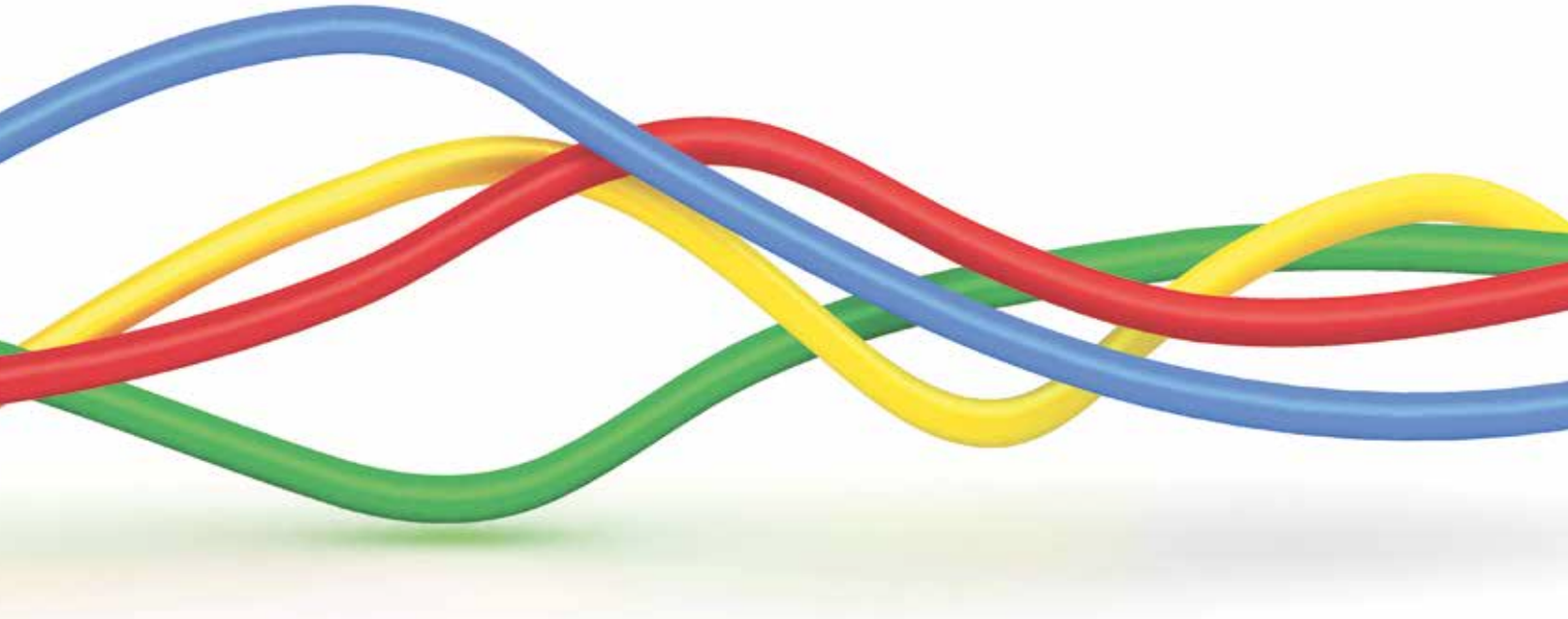
Adjustable elasticity

Its worldwide availability, high hardness and chemical resistance makes quartz a versatile natural raw material.

In cables mainly the grade SIKRON® SF 600 and/or the coated types SILBOND® 600 TST and SILBOND® 600 RST. The treatment of the filler with trimethyl silane (-RST) provides a low viscosity during the processing of the silicone. By employment of this filler the electrical and mechanical characteristics of the silicone part can be specifically influenced (e.g. increase of the electrical insulation properties).

With SIKRON® and SILBOND® filled silicone polymers can be characterised by the following properties:

- *adjustable elasticity and shore-hardness*
- *adjustable thermal expansion*
- *very well coloring characteristics*
- *increased electrical insulation properties*
- *decreased contraction during reaction*



煅烧高岭土 CALK 89/1.3 对基于 EPDM 的电缆有积极影响

高岭土是橡胶工业中最重要的填料之一，可用于无数配方中，以通过注塑或挤压制造最终产品。高岭土可帮助调节硬度、弹性，对硫化工艺有一定的影响，并可改善橡胶成品的气密性。CALK 89/1.3 是一种煅烧高岭土，通过在 600°C以上的温度下煅烧制成。与其他EPDM电缆配方中的填料相比，使用CALK 89/1.3具有以下优点：

- 热存储前后的机械性能显著提高
- 更快的硫化行为
- 焦化时间缩短
- 更好的粘度

Calcined kaolin CALK 89/1.3 with positive influence on cables based on EPDM

Kaolin is one of the most important fillers in the rubber industry and isused in countless formulations that are injection molded or extruded into the final product. Kaolin has a supporting effect on the setting of hardness, elasticity, has an influence on the vulcanization process and promotes the gas-tightness of the rubber end product. CALK 89/1.3 is a calcined kaolin produced by firing at temperatures above 600°C. Compared to a usually used filler in an EPDM-based cable formulation, the use of CALK 89/1.3 offers the following advantages:

- *significantly better mechanical properties before and after hot storage*
- *faster vulcanization behavior*
- *lower scorching time*
- *better viscosity*

CALK 89/1.3	
SiO_2	58 %
AL_2O_3	38 %
Fe_2O_3	0.9 %
TiO_2	0.3 %
MgO	0.2 %
pH 值 | *pH-value*	7
密度 | *density*	2.6 g/cm³
亮度 | *brightness*	Y > 91
中值粒径 | *medium grain size* d_{50}	1.3 µm

HPF Minerals Ltd.

轻量化

长期以来，塑料一直是汽车行业减轻重量的首选材料。尽管电动车辆的重量在降低油耗和减少温室效应方面没有未起决定性作用，但是电动车辆的重量仍然是一个不可忽略的因素，因为较低的车辆重量对驾驶行为和碰撞行为有积极的影响。

因此，未来塑料零件的使用比例将大大增加。特别是热固性塑料和热塑性塑料将越来越多地取代钢、铝和铸铁。当然，对塑料机械强度的要求也相应地提高。矿物填料被用于有针对性地改变聚合物体系的性能。随着电子组件的小型化发展趋势，新的挑战也随之而来。高性能填料可以为新型塑料满足未来这些日益增长的需求做出重大贡献。

More lightness is required

Plastics have long been the material of choice in automotive engineering for reducing weight. Although weight does not play a role in electric vehicles in terms of fuel economy and greenhouse effect, it should remain an important aspect regardless of the powertrain, as a lower vehicle weight generally improves driving and crash performance.

The proportion of plastic parts used will increase considerably in the future. In particular, thermosets and thermoplastics will increasingly replace steel, aluminium and cast iron. The demands placed on the mechanical strength of plastics are constantly increasing. Mineral fillers are used to specifically change the properties of polymer systems. As electronic components become smaller and smaller, new challenges also arise. High Performance Fillers can make a major contribution to modern plastics meeting these increasing requirements in the future.

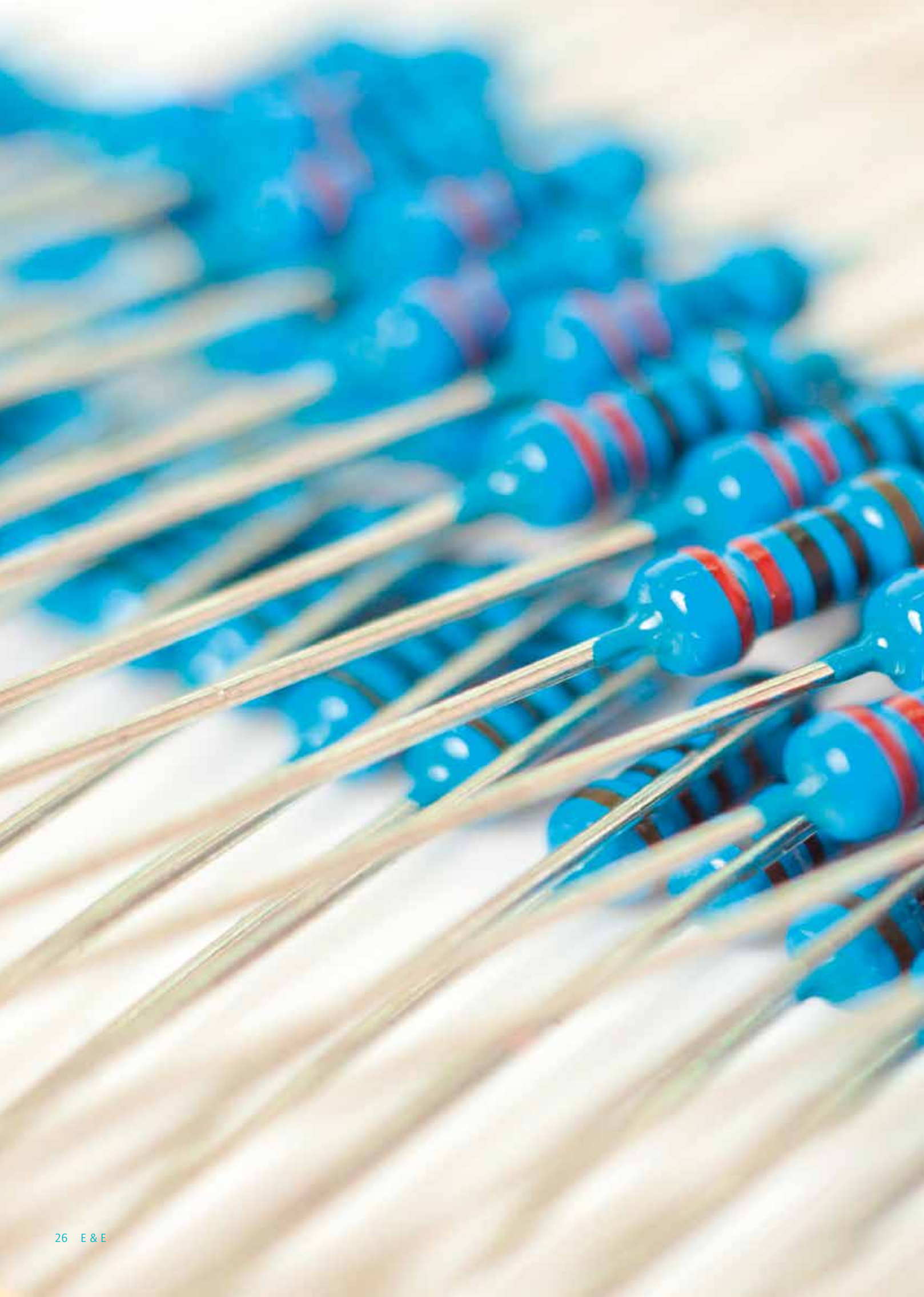
我们拥有多年的经验和专业技术，能够开发创新产品和定制解决方案，并处于电动汽车的最前沿。我们的矿物填料为当前和未来的电动和混合动力车辆提供了新的可能性。

有关更多详细信息，请参阅单独的《电动汽车》手册。

With many years of experience and know-how, we develop innovative products and tailor-made customer solutions and are at the forefront in the field of e-mobility. Our mineral fillers can be used in both current and future electric and hybrid vehicles. Further detailed information is available in our separate brochure E-Mobility.

我们走在最前沿
We drive right at the top

HPF Minerals Ltd.



电绝缘涂层

电绝缘涂层由于具有良好的电绝缘性能可保护电路板和电子组件免受损坏。它们可以承受高温和低温工作环境，并适用于许多应用。

经过表面处理的 SILBOND® 石英细粉可为现代涂料体系的质量提供以下优势：

- 防潮和防冷凝
- 防腐蚀保护
- 耐磨
- 长使用寿命

如果需要散热，还可以使用我们的 SILATHERM® 产品系列。

Electrical insulating varnishes

Electrical insulating varnishes protect circuit boards and electronic components from damage as they offer good electrical insulation properties. They withstand both hot and cold work environments and are being used in manifold applications.

Our surface-treated SILBOND® silica fine powders are always used when the following propteries are decisive for the quality of a contemporary paint system:

- *resistance to moisture and condensation*
- *anti-corrosion*
- *abrasion resistance*
- *durability*

If heat dissipation is required, types from our SILATHERM® product range are also used.

本手册未包含我们的填料在电气和电子行业中的所有应用。我们的目的是让您对各个应用领域有个初步的了解。我们的开发部门可为客户开发特定的解决方案。请联系并告诉我们您的要求。我们为您的聚合物体系提供合适的填料。

It is not possible to cover all the different applications in the electrical and electronics industry where our fillers are used in this brochure. We have tried to give you a little insight into the various fields of application. Our development department specialices in developing solutions for the respective customer system. Please contact us for your request. We also have the right filler for your polymer system.

Quarzwerke 是一家具有先进质量理念的公司，并通过了 DIN EN ISO 9001 认证，可确保从提炼到交付的整个过程都顺利进行。DIN EN ISO 14001 的成功实施证明了 Quarzwerke 具有全面的环境管理能力。

Quarzwerke is a company with a highly convincing quality philosophy, certified in compliance with DIN EN ISO 9001, so that everything runs without a hitch from extraction to delivery. The successful implementation of DIN EN ISO 14001 proves that Quarzwerke exhibits a holistic environmental management.

09.2022

我们的一些产品根据欧洲 CLP 法规（EC/1272/2008）被划分为 STOT RE 1 类或 2 类。详情请参阅相应的材料安全数据表。

本手册中的数据在我们的认知范围内收集和编写。但是，我们要求大家理解，我们不对结果以及建议的适用性和完整性承担责任，也不保证未侵犯任何第三方专利权。如有任何问题，欢迎向我们咨询。

在含高岭土的纸上印刷。

Some of our products are classified into the STOT RE cat.1 or 2 according to the European CLP Regulation (EC/1272/2008). More detailed information is available from the respective material safety data-sheet.

The figures documented in brochure were collected and shown to the best of our knowledge. However, we ask for understanding that we cannot take over liability for the results in individual cases and for the suitability and completeness of our recommendations, and cannot guarantee that no third-party patent rights are restricted. We are available for further questions and consultation.

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