High Purity Quartz Material



1. Application

The high purity quartz (HPQ) is one of main materials in the silica and silicon industry field. It is produced by the silica ore (or said natural quartz or crystal ore) through and by the processing and creating ways of crushing, grinding, classification, sorting, chemical washing and leaching, thermal processing and calcinations, mechanical and thermal dewatering and so on.

The HPQ series materials can be widely used in the lighting industry, semiconductor, electronics, optical industry, fiber optics, crucible, tube, rod and production of special filament and tissues in the worldwide market.

2. Type and Specification

2.1. HPQ-GG

The HPQ-GG (High Purity Quartz, Glass Grade) is mainly used for producing of quartz glass such as optic glass, fabric glass, photovoltaic glass and related plate etc. per the following specifications:

HPQ-GG Chemical Components			
Item	Element	Unit	Mean / Max. （Typical Data）
1	Al	ppm	20.00
2	Ca	ppm	1.50
3	Fe	ppm	2.50
4	K	ppm	4.50
5	Li	ppm	0.30
6	Mg	ppm	0.40
7	Mn	ppm	0.10
8	Na	ppm	6.50
9	Ti	ppm	1.20
10	Zr	ppm	0.10

Size Distribution （Reference Only）	
Mesh (US Standard)	Retained (%)
40	0.0
50	0.2
70	28.1
100	36.9
140	28.9
200	5.6
325	0.3

Pan	0.0

Note: *All of the above specifications and even the typical data are only for the reference, not guarantee value. The exact data shall be subject to the analysis result provided by the producer or the seller.*

2.2. HPQ-SG

The HPQ-SG (High Purity Quartz, Standard Grade) is mainly used for producing of quartz tube, rod, disc, plate and related quartz products per the following specifications:

HPQ-SG Chemical Components			
Item	Element	Unit	Mean / Max. （Typical Data）
1	Al	ppm	10.00 / 15.00
2	Ca	ppm	0.80 / 1.20
3	Fe	ppm	0.50 / 1.00
4	K	ppm	0.50 / 1.20
5	Li	ppm	0.40 / 0.50
6	Mg	ppm	0.02 / 0.05
7	Mn	ppm	0.02 / 0.06
8	Na	ppm	0.90 / 1.50
9	Ti	ppm	0.90 / 1.20
10	Zr	ppm	0.40 / 1.20
11	B	ppm	0.01 / 0.04
Additional Mean Chemical Values (Reference Only)			
Item	Element	Unit	Mean / Max. （Typical Data）
1	Co	ppm	<0.0005
2	Cr	ppm	<0.05
3	Cu	ppm	<0.05
4	Ge	ppm	0.5
5	Ni	ppm	<0.05
6	P	ppm	0.10
7	Sr	ppm	<0.30
8	V	ppm	<0.01
9	Zn	ppm	<0.05
Physical Analysis (Typical Data)			
1.5% Max. +50 Mesh (>300 micron) 1% Max. -200 Mesh (<75 Micron)			
Size Distribution （Reference Only）			
Mesh (US Standard)			Retained (%)
50			0.0
70			20.3
100			59.9

140	18.4
200	1.4
325	0.0
Pan	0.0

Note: *All of the above specifications and even the typical data are only for the reference, not guarantee value. The exact data shall be subject to the analysis result provided by the producer or the seller.*

2.3. HPQ-CG

The HPQ-CG (High Purity Quartz, Crucible Grade) is mainly used for producing of quartz crucible which can be used for producing of mono crystalline silicon from poly crystalline silicon in the photovoltaic industry served solar energy field per the following specifications:

HPQ-CG Chemical Components			
Item	Element	Unit	Mean / Max. （Typical Data）
1	Al	ppm	10.00 / 15.00
2	Ca	ppm	0.50 / 1.00
3	Fe	ppm	0.20 / 0.35
4	K	ppm	0.50/ 0.70
5	Li	ppm	0.15 / 0.30
6	Mg	ppm	0.05 / 0.10
7	Mn	ppm	0.01 / 0.02
8	Na	ppm	0.50 / 1.00
9	Ti	ppm	1.20 / 1.35
10	Zr	ppm	0.01 / 0.03
11	B	ppm	0.005 / 0.15
12	P	ppm	0.05 / 0.15
13	Cu	ppm	0.01 / 0.03
14	Cr	ppm	0.01 / 0.02
Physical Analysis (Typical Data)			
100 - 300 micron 1% max. more than 300 micron（50 mesh） 1% max. less than 75 micron (200 mesh)			

Note: *All of the above specifications and even the typical data are only for the reference, not guarantee value. The exact data shall be subject to the analysis result provided by the producer or the seller.*

2.3. HPQ-WG

The HPQ-WG (High Purity Quartz, Window Grade) is mainly used for production of window and ingot used in the specialty aviation, spaceflight, lighting and semiconductor applications per the following specifications:

HPQ-WG Chemical Components			
Item	Element	Unit	Mean / Max. （Typical Data）
1	Al	ppm	3.50 / 10

2	Ca	ppm	0.10 / 0.5
3	Fe	ppm	0.05 / 0.5
4	K	ppm	0.30 / 0.8
5	Li	ppm	0.10 / 0.5
6	Mg	ppm	0.01 / 0.5
7	Mn	ppm	0.01 max.
8	Na	ppm	0.30 / 0.95
9	Ti	ppm	0.10 / 1.50
10	Zr	ppm	0.01 max.
11	B	ppm	0.05 / 0.15
12	P	ppm	0.10 max.
13	Cu	ppm	0.01 max.
14	Cr	ppm	0.01 max.
15	Zn	ppm	0.01 max.
16	Ni	ppm	0.01 max.
17	Co	ppm	0.01 max.
18	Sr	ppm	0.01 max.
19	Ba	ppm	0.01 max.
20	Ge	ppm	0.50 / 1.0
Physical Analysis (Typical Data)			
100 - 300 micron 1% max. more than 300 micron（50 mesh） 1% max. less than 75 micron (200 mesh)			

Note: *All of the above specifications and even the typical data are only for the reference, not guarantee value. The exact data shall be subject to the analysis result provided by the producer or the seller.*

2.5. HPQ-LG

The HPQ-LG (High Purity Quartz, Lining Grade) is mainly used for lining, coating and covering the furnace of the quartz crucible and related quartz products in order to improve the strength and power for the performance of the quality per the following specifications:

HPQ-LG Chemical Components			
Item	Element	Unit	Mean / Max. （Typical Data）
1	Al	ppm	15.00 / 20.00
2	Fe	Ppm	0.05 / 0.15
3	Na	ppm	0.05 / 0.10
4	K	ppm	0.15 / 0.30
5	Ca	ppm	0.50 / 1.00
6	Li	ppm	0.50 / 1.00
7	Ti	ppm	1.20 / 1.50
Additional Mean Chemical Values (Reference Only)			

Item	Element	Unit	Mean / Max. （Typical Data）
1	Mg	ppm	0.1 max.
2	Mn	ppm	0.05 max.
3	Cu	ppm	0.01 max.
4	B	ppm	0.1 max.
5	Co	ppm	0.01 max.
6	Cr	ppm	0.01 max.
7	Ni	ppm	0.01 max.
8	Zr	ppm	0.1 max.
Physical Analysis (Typical Data)			
170-320 micron 95 micron min. 550micron max.			
Size Distribution （Reference Only）			
D10			120 micron
D50			240 micron
D90			420 micron

Note: *All of the above specifications and even the typical data are only for the reference, not guarantee value. The exact data shall be subject to the analysis result provided by the producer or the seller.*

3. Packing

200/218/226.50/250Kg net per carton drum, and 4 drums per pallet, or 350/500/1000/1250Kg net per poly plastic inner bag and jumbo bag, and subject to the final confirmation per our Sinosi plant option and confirmation.

4. Using field introduction (a part of only)

The HPQ series materials can be widely used in the lighting industry, semiconductor, electronics, optical industry, fiber optics, crucible, tube, rod and production of special filament and tissues in the worldwide market. The descriptions are as follow:

Lighting industry


The main products from quartz glass in lighting industry are quartz tubes. They fall into 4 basic types according to application spheres:

- tubes from transparent quartz glass for high-temperature mercury, halogen and UV lamps, thermocouples, semiconductor products, waveguide auxiliaries and other high-temperature devices;
- tubes from transparent quartz glass with titan oxide admixtures for blocking of intense UV radiation, used in bactericidal lamps with transmission in some areas of the UV spectrum;
- tubes from transparent quartz glass with cerium admixtures for blocking UV radiation, efficient in the visible part of the spectrum;

- tubes from synthetic ultra high purity quartz with low content of hydroxyl, used in casing and bandages for UV and ozone lamps, medical and chemical equipment and in latest models of semiconductor devices.

Semiconductor industry


Tubes from fused quartz of high chemical purity and high heat resistance are perfect furnaces for production of silicon wafers for semiconductor industry. The best and latest models of the tubes have a diameter up to 550mm with an overall content of impurities less than 25 ppm. For most precious articles, tubes with low alkali content (0,1 ppm) are required. Other quartz products used in semiconductor production are quartz caps and opaque quartz rings, also made from high purity fused quartz. Holders for semiconductor wafers are made from fused quartz glass rods and ingots; the requirements for fused quartz used to produce plate holders are very strict in what concerns air streaks and inclusions, as well as size distributions.

Optical industry


Optical industry is a traditional consumer of quartz glass. Quartz glass is used in production of lenses for telescopes and laboratory optical devices, communication devices, diffraction lenses, projection displays, optics for scanning devices and printers, lasers, as well as photo cameras, ultra-flat TV screens, flame control devices, etc.

Crucible production


Quartz Crucible production is part of semiconductor industry. However, this application is often singled out due to its particular place in the production. The quartz crucible are widely used for the production of polycrystalline silicon(polysilicon) and mono crystalline silicon(monosilicon) from silicon metal. In order to produce the high-quality semiconductor plates, polysilicon is placed into a quartz crucible heated to a high temperature, and a monosilicon is drawn out of the melted silicon. The fused quartz is one of the few materials that combine high purity and heat resistance required for the process. Crucible production is a very complicated process, and a special know-how is needed to produce a crucible of a definite size. The main producers try to make crucibles larger and larger: the larger is the diameter of the crucible, the wider is the diameter of the crystal and the silicon wafer that can be obtained. General Electric, for example, produces crucibles with diameters between 12 and 32 inches and cuts silicon wafers 100-300 mm in diameter.

Fiber optics


The fused quartz is also used in fiber optics, one of the youngest and most progressive applications of industry. Supporting tubes for light guides are made of natural as well as of synthetic quartz. The latter has better properties but is much more expensive. That is why most plants successfully develop and use their own technologies for production of light guide supporting tubes from natural quartz. Besides supporting tubes, fiber optics makes use of quartz rods and tubes for exhaust and reinforcement, as well as of large diameter quartz tubes for special-purpose furnaces.

Production of special filament and tissues


Quartz fiber and twist yarn are used in various materials, for example, in cables for refractory insulation. Isolation hoses are used in glass industry, heaters, laboratory equipment and electric wiring. Quartz tissues, woven and non-woven, are used as the basis for lamination of high-quality printed circuits and radar shields. Non-woven materials from quartz glass are used in removable cones for space shuttles. Due to low thermal conductivity and high resistance to aggressive solutions and gases these materials are especially good as filters and insulators for chemical and metallurgical industries.

5. Quality Control


The HPQ materials are controlled by a full time laboratory facility providing analytical support related to quality control combined with ongoing R&D for all of the products and activities.
Analytical capabilities include wet chemistry, microwave digestion, atomic absorption, computer driven ICP and flame photometry. The laboratory also performs complete sample preparation including crushing, grinding and magnetic separation and can simulate all plant beneficiation methods.

6. Background and current quartz world market


High purity quartz market is developing very quickly. The main supplier of high purity quartz sand is the Unimin Company, USA that develops pegmatite deposits in Spruce Pine, North Carolina. The company, being provided with high quality raw material, has developed a very efficient beneficiation process that is continuously being improved and that provides stable high quality of the product. The quartz sand produced by the company is divided into several grades that have become world standards of high quality such as Iota-Standard, Iota-4, Iota-6, Iota-8 and so on.

Another company in high purity quartz market is Coleman Quartz which mines rock crystal in Arkansas, USA. Annual supply varies between 350 and 500 tons. The company's product is used as burden material and seed in hydrothermal synthesis of quartz crystals.

Brazil was the world's main supplier of high purity quartz until 1974. The quartz was supplied in the form manually beneficiated quartz lumps (the so-called lascas), mined from various deposits across the country. Annual supply amounted to 10 thousand tons a year. However, after the passing of an erroneous government resolution about embargo, a new processing technology was developed in the USA that allowed substituting such rare material as rock crystal for rock-forming quartz from pegmatite bodies and hydrothermal quartz veins. As the result, the demand for Brazilian rock crystal fell. Numerous small mining companies are still operative, but as the quality of rock crystal has deteriorated, the demand for it has decreased. Annual supply of Brazilian quartz is now estimated as about 3.5 thousand tons, maybe even less. Separate lots of Brazilian rock crystal appear from time to time in Russian market, but its quality leaves much to be desired. In the present days, several Brazilian companies are trying to create a complex for vein quartz mining and processing with the purpose of entering the world market, but these attempts have so far been unsuccessful.

Madagascar is another well-known supplier of quartz to the world market. The raw material here is represented by

rock crystal and transparent vein quartz mined from hydrothermal quartz veins and pegmatites. With a relatively high content of aluminum, titanium and lithium, the local quartz has high optical transmission, which makes it suitable for the melting of optical glass. The mining volume, according to the data we have, is about 2.5 thousand tons a year. The mining and processing of quartz are realized by rather primitive methods with ample use of manual labour. The best deposits of the island are owned by French and German companies. During the last 20 years even some Russian companies have bought deposits here.

India is one of the most asset suppliers of high purity quartz since late 1970's. The country has about 200 mines with rock crystal and vein quartz from pegmatites. The quality of local quartz varies greatly, which is made use of by Japanese and German companies that buy the produce of small companies. This quartz is processed in Japan, where it is used for production of quartz crucibles. In recent years various Indian companies have been intensely searching for a new quartz processing technology and making tests in Germany and the USA.

China, a country which is rapidly conquering the world market, is developing high purity quartz production. At numerous (about 300) processing plants, manually beneficiated rock crystal (about several thousands tons a year) and quartz particulate for melting optical glass are produced. Moreover, there are about 15 companies that grow artificial quartz crystals. This can be also confirmed by the mentioning in Chinese sources of at least 60 quartz glass melting companies. Most part of the quartz consumed here is mined within the country from alluvial and coastal sediments, and some primary quartz deposits developed in Hebei, Jiangsu, Jiangxi, Fujian, Shandong, Anhui, Sichuan, Gansu etc. are all not too much.

Norway is represented in the world quartz market by Norwegian Crystallites AS Company. Since 1996 it has been successfully developing the quartz nuclei of pegmatite bodies by subterranean method. Norwegian quartz has rather high content of aluminum and titanium and low content of iron, uranium and thorium. The company produces 4 grades of quartz concentrate in fractions of 0-150 micron and 100-300 micron. The company's quartz is used in optical industry.

Russia has a good basis for high purity quartz production. Until recent times, quartz concentrates for melting quartz glass were produced by many companies, and the annual supply of quartz to industry was 12 thousand tons in 1991. The main mining companies were located in Southern and Middle Urals. In the pattern of consumption, the predominant product was represented by granulated vein quartz (up to 60%). Transparent and translucent quartz constituted an insignificant part; besides, rock crystal (about several thousand tons a year) was becoming less popular, as about the same amount of artificial crystals was grown annually by hydrothermal synthesis. In some years Russia imported up to 400-500 tons of Brazilian rock crystal. The traditional scheme of Russian market included companies that mined quartz and beneficiated it only by physical methods (crushing, grinding, optical, magnetic and electrostatic separation) and companies that subjected quartz to deep chemical beneficiation and melting.

In the 90's, Russian quartz industry, being not able to compete with the Western market, almost collapsed, most plants either closed or slashed their production volumes. Mining companies are searching to develop their own process flowsheets aimed at production of competitive quartz product that could be used in foreign and domestic markets. The need of Russian industry for high purity quartz for melting quartz glass has been estimated by the Federal program as 5500 tons a year.

7. Contact information

If you have any more enquiry or comments for above mentioned specifications and related information, then please contact su as per the follow information:

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8. Special Note

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