



GMA GARNET GROUP

Understanding Australia's Silica Limits in Abrasive Blasting

gmagarnet.com



Contents

Introduction	3
What is crystalline silica?	3
Free Crystalline silica and effects on health	3
Free crystalline silica and garnet	4
Australia's silica limit	5
Background	5
Free crystalline silica: Concentration levels in the bag and the air	5
SiO ₂ (quartz and free crystalline silica) reporting in product documentation	6
Understanding what's in the bag	7
What does this mean for your abrasive blasting operations?	8
Responsibilities and safety duties required	8
Reliable supply and performance	9
Security of supply - fully integrated global business	9
Our supply chain	10
Rigorous sampling process	11
The preferred industry choice	12
References	12



Introduction

This discussion paper aims to help inspectors, safety and environmental professionals understand silica, free silica, what is in a bag of GMA Garnet™, and what it means to abrasive blasting operations.



What is crystalline silica?

Silica is silicon dioxide, a natural, widely abundant mineral that forms a major component of most rocks, sands, and soils. There are non-crystalline and crystalline forms of silicon dioxide. The most common type of crystalline silica is quartz. The amount varies widely amongst different rocks, rock products, and can be found in aggregates like mortar, concrete, and mineral sands.



Free Crystalline silica and effects on health

When workers inhale the free crystalline silica, the lung tissue reacts by developing fibrotic nodules and scarring around the trapped silica particles. This fibrotic condition of the lung is called silicosis. When the nodules grow too large, breathing becomes difficult, and it may result in death. Silicosis victims are also at high risk of developing other chronic diseases such as lung cancer, chronic bronchitis and tuberculosis.

Free crystalline silica and garnet

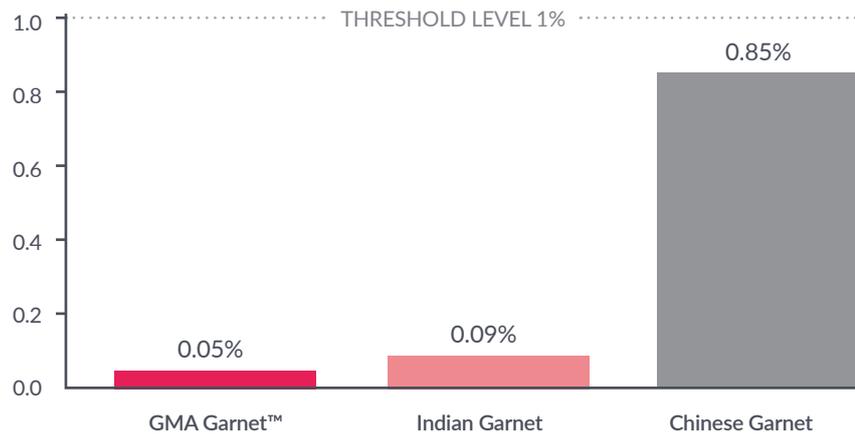
GMA Garnet™ is
20x
 lower than the
 threshold limit.

Garnets vary in quality based on factors such as the deposit, mining practices, and processing controls implemented.

GMA's concentrate in Australia are derived from older rock deposits which have been through millions of years of prolonged attrition to become solid almandine garnet particles. Through GMA's world-class mining and processing procedures, *the free quartz* and other waste materials are virtually removed. Rigorous testing is conducted multiple times a day to ensure high garnet purity and concentration levels. Independent third party tests are also conducted regularly to determine low levels of free crystalline silica and readily available upon customer's request. GMA's free crystalline silica results come well *under the minimum threshold of 1% of weight by volume (usually under 0.1%)*.

Tip: Request independent test reports following as close to the Standard AS4350.2-1999 for HLS determination.

SILICA (WEIGHT %) OF FREE CRYSTALLINE SILICA QUARTZ





587,000
 Australian workers
 were exposed to
 silica dust in the
 workplace in 2011.*

Australia's silica limit

Background

A health-based review of the current scientific evidence for silica dust showed that the Workplace Exposure Standard (WES) should be reduced to prevent adverse health effects (i.e. silicosis and lung cancer) in workers.

The proliferation of synthetic stone tops has led to a spike in health-related cases and silica dust exposure. The synthetic material has a higher concentration of dangerous particles compared to natural stones like marble.

Recently, the Australian government has tightened its controls, aiming to reduce 30% of serious silica dust related serious injuries and illnesses by 2022².

Free crystalline silica - Concentration in the bag and the air

What's in the bag

The Standards state that:

1. Materials with more than 1% free crystalline silica should not be used for abrasive blasting.

GMA takes reference from ISO 11126-10:2017, SSPC-AB1 (NIOSH Method 7500)³ that outlines the latest free crystalline silica limits.

What's in the air

2. Respirable crystalline silica (silica dust) limits have changed from 0.1 mg/m³ to 0.05 mg/m³.⁴

The 0.05 mg/m³ free crystalline silica limit states the concentration of an airborne hazardous chemical (e.g. respirable crystalline silica) within a worker's breathing zone should not cause adverse health effects or undue harm. Compliance with the WES is required under the Commonwealth, state and territory Work Health and Safety (WHS) laws.

This means that workers should not be exposed to more than 0.05mg/m³ silica dust over an eight-hour working day (i.e. time weighted average) for a five day work week.

It is important to check in with your local WHS regulator to see if they have introduced any new regulations for silica dust in addition to reducing the WES⁵.

¹ <https://www.safeworkaustralia.gov.au/exposure-standards>

² <https://www.safework.nsw.gov.au/resource-library/hazardous-chemicals/crystalline-silica-technical-fact-sheet>

³ ISO 11126-10 Preparation of steel substrates before application of paints and related products – Specifications for non-metallic blast-cleaning abrasives Part 10 listed in section 6.1 General Requirements.

SSPC-AB1 Section 4.1.7.1 – Class A Less than 1% crystalline Silica (Analysis by NIOSH Method 7500)

⁴ <https://www.safeworkaustralia.gov.au/exposure-standards>

⁵ <https://www.safeworkaustralia.gov.au/whs-authorities-contacts>



SiO₂ (Quartz and Free Crystalline Silica) Reporting in Product Documentation

The “Average Chemical Composition” presented in the Product Data Sheet (PDS) provides the chemical arrangement, type and molecules that make up the garnet. It is the actual chemical elements that make up the garnet grain. This is a common method of reporting the composition of sand, rock and soil samples.

It is important to note that the chemical composition does not represent the physical composition of the product. The relative proportion of SiO₂ reported in the “Average Chemical Composition” table does not represent physical grains of ‘silica sand’ or free silica dust. Rather, the relative proportion of SiO₂ reported has been determined from the Silicon (Si) and Oxygen (O) content contained within the garnet mineral. The garnet mineral is therefore represented in the chemical formula Fe₃Al₂(SiO₄)₃. Refer to PDS and SDS exerts as shown below.

Upon blasting, the garnet grain does not fragment into SiO₂ (free silica), FeO, and MgO, etc. Upon impact, garnet grain would break into small grains.

SiO₂ chemical composition on PDS does not mean free crystalline silica.

Tip: Request 3rd Party verification reports on free crystalline silica content in blast abrasive.

SiO₂ chemical composition referred to in the PDS document is bound within the garnet crystal, and is not free silica.

PRODUCT DATA SHEET - PREMIUMBLAST™

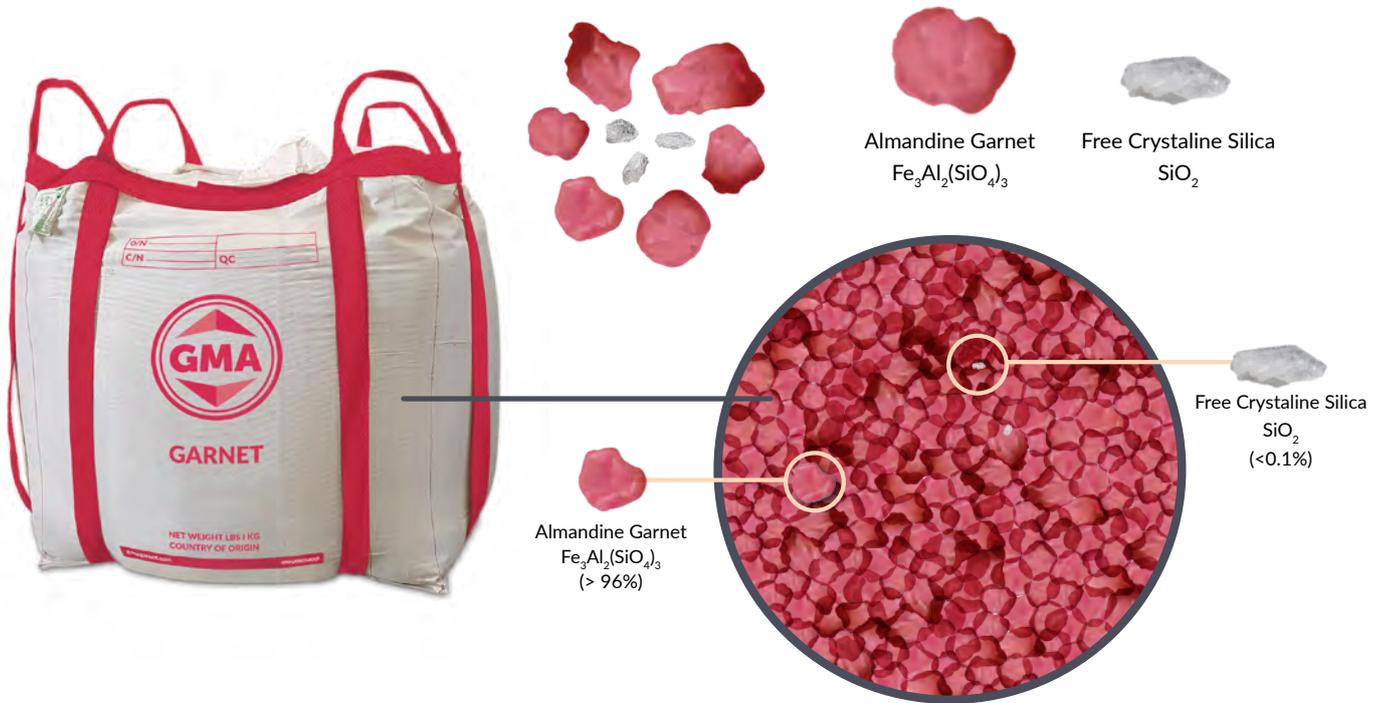
Average Chemical Composition (Typical)		
SiO ₂*	.....	37%
Al ₂ O ₃	.....	21%
FeO	.....	30%
Fe ₂ O ₃	.....	2%
MgO	.....	6%
CaO	.....	2%
TiO ₂	.....	1%
MnO	.....	1%

*Refers to SiO₂ bound within the lattice of the homogeneous garnet crystal (not free silica)

Data obtained from GMA Garnet™ Australia product line.

Understanding what's in the Bag

As per GMA's SDS, a bag of GMA Garnet has greater than 96% of almandine garnet and less than 0.1% of free crystalline silica (refer to diagram below).



SAFETY DATA SHEET : Composition / Information on ingredients

This material is a natural mixture of almandine garnet and other trace minerals.

Chemical Identity	Common Name	CAS Number	Proportion (weight %)
$\text{Fe}_3\text{Al}_2(\text{SiO}_4)_3$	Almandine Garnet	1302-62-1	Greater than 96%
FeTiO_3	Ilmenite	12168-52-4	Less than 3.5%
CaCO_3	Calcium Carbonate (free)	471-34-1	Less than 1%
ZrSiO_4	Zircon	14940-68-2	Less than 0.1%
SiO_2	Crystalline Silica (free)	14808-60-7	Less than 0.1%

Data obtained from GMA Garnet™ Australia product line.

What does this mean for your abrasive blasting operations?



Safework Australia recently released an updated Code of Practice in July 2020. The latest code provides practical guidance to the Person Conducting Business Undertaking (PCBU) on ways to manage health and safety risks associated with abrasive blasting⁶. The code was implemented to have businesses' monitor its respirable dust so that it complies with the latest WES 0.05mg/m³ free crystalline silica requirements.



Responsibilities and safety duties required

Duty holders who have a role in managing the risks of abrasive blasting include:

- Persons conducting a business or undertaking
- Designers, manufacturers, importers, suppliers, and contractors/installers of plant, substances or structures
- Company directors and officers
- Workers have a duty of care for their own safety as well as not have adversely affect the health and safety of others
- Other persons and visitors must take reasonable care.

⁶ https://www.safeworkaustralia.gov.au/sites/default/files/2020-07/model_code_of_practice_abrasive_blasting%20.pdf



Reliable supply and performance

“In the 1970's GMA pioneered the use of garnet minerals as a natural industrial abrasive.”

Security of supply - fully integrated global business

GMA is the only company that owns the supply chain from the mine to customer. Being a fully integrated global business, we are able to maintain an uninterrupted high-quality, consistent garnet supply to our customers.

We own and operate mines in Australia and the USA, and have long term agreements with a significant supply source in South Africa. These operations provide us with an ample, consistent, and secure garnet supply.

Our Supply Chain



Restoration

The tailings sands are returned to the mined area which is rehabilitated to its former environment.

1



Mining

Garnet rich sand is mined and transported to our 24/7 'Wet' plant for processing.

2



Wet Plant

Water and centrifugal forces are used to separate the garnet from lighter waste minerals, leaving a high quality garnet concentrate.

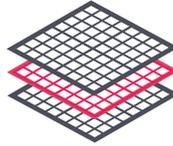
5



Final Quality Control

Final laboratory testing ensures the highest quality standards are met.

4



Dry Plant

Magnetic separators remove impurities and the pure garnet is screened and graded into the correct size particles.

3



Quality Control

The concentrate is sample tested in the laboratory to ensure consistent product quality.

6



Packaging

GMA Garnet is packaged into one-tonne or two-tonne bulk bags and 25kg paper bags.

7



Distribution

GMA Products are distributed in 80 countries via our warehouses and over 100 distributor outlets worldwide.

8



Customer Service

Dedicated sales team assist customers in selecting the best products and logistics arrangements.

9



Technical Support

Our experts support customers in solving technical challenges and maximizing productivity and performance of their projects.

Rigorous sampling process

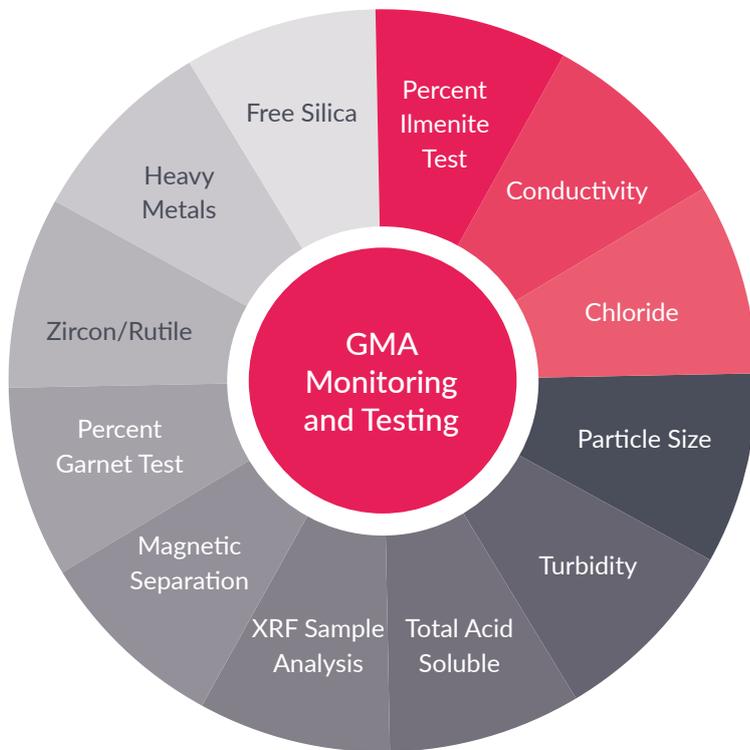
Samples are taken every two hours to ensure GMA's processed garnet are of the highest standards. For more than 40 years, we have developed advanced monitoring and processes that are embedded into our operations.

Particle is regularly conducted to ensure that we meet the highest industry and product quality standards. The analytical information from these results is used to ensure the accuracy of the PDS and SDS of GMA products. GMA undertakes rigorous internal and external product testing before packaging and dispatching garnet product to customers (refer to image below).



Independent reports are performed regularly to ensure product accuracy.

GMA GARNET™ PRODUCT MONITORING AND TESTING



Tip: Request Third Party Reports to ensure product safety and integrity.

To ensure accuracy, third party product testing reports are also available upon request.

Test	Frequency
Particle Size	Completed every 2 hours
Turbidity	Completed per batch
Total Acid Soluble	Weekly
XRF analysis	6 monthly
Zircon/ Rutile	
Magnetic Separation	Completed every 2 hours during production
Percent Ilmenite test	
Heavy Metals	6 monthly
Free Silica	6 monthly
Conductivity	per 24 hours (Production)
Chloride	per 24 hours (Production)

The preferred industry choice

GMA has been in business for over 40 years, supplying high-quality garnet abrasives. GMA offers a complete range of garnet abrasives for any surface preparation requirement from removing resistant coatings and heavy rust, to fast millscale removal and specialty coating requirements.

GMA Garnet™ is approved by leading paint manufacturers and is the preferred abrasive among global oil & gas companies, full-service shipyards and international fabricators.

Find out more about how we can work together to keep your worksite and workers safe when using GMA Garnet™ abrasives.

References

1. Workplace exposure standards for chemicals
<https://www.safeworkaustralia.gov.au/exposure-standards>
2. Crystalline silica - technical fact sheet
<https://www.safework.nsw.gov.au/resource-library/hazardous-chemicals/crystalline-silica-technical-fact-sheet>
3. ISO 11126-10 Preparation of steel substrates before application of paints and related products – Specifications for non-metallic blast-cleaning abrasives Part 10 listed in section 6.1 General Requirements. SSPC-AB1 Section 4.1.7.1 – Class A Less than 1% crystalline Silica (Analysis by NIOSH Method 7500)
<https://www.iso.org/standard/65967.html>
4. Workplace exposure standards for chemicals
<https://www.safeworkaustralia.gov.au/exposure-standards>
5. WHS authorities' contact information
<https://www.safeworkaustralia.gov.au/whs-authorities-contacts>
6. Abrasive Blasting Code of Practice
https://www.safeworkaustralia.gov.au/sites/default/files/2020-07/model_code_of_practice_abrasive_blasting%20.pdf



GMA GARNET GROUP

HEAD OFFICE

Level 4, 108 St Georges Terrace, Perth
Western Australia 6000

T +61 8 9287 3200

E info.au@gmagarnet.com

gmagarnet.com