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QUARTZ SURFACES

WHITE PAPER

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Title: Quartz, Silica Sand, Granite, Marble, Rocks & Minerals

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Many types of naturally occurring materials such as granite, marble, rocks, etc. are used for both interior and exterior surfacing applications. Some are used in the raw form (granite/marble), while others are combined with various ingredients to produce a surfacing material. It is important to understand the basic differences in the wide variety of materials used as this has dramatic impact on the final aesthetics and performance of a given surfacing material. The following information is offered to help individuals understand some of the differences between quartz, silica sand, granite, marble & other minerals. This information is commonly available in a variety of widely published documents.

Minerals versus Rocks

Minerals are inorganic (non-living) solids that are found in nature. Minerals generally grow in liquids deep in the earth's crust where individual atoms combine to grow crystals.

Rocks are natural aggregates or combinations of one or more minerals. Rocks are formed through a variety of processes

There are three types of rock:

- Igneous is formed when molten Magma cools and hardens; common forms are granite, basalt, obsidian, & peridotite.
- Sedimentary is formed through the erosion of larger rocks and minerals, often carried to a new site by wind or water, and then deposited in layers where over time they are cemented together to form new rocks. Common forms are sandstone, limestone, clay, and chalk.
- Metamorphic rocks originate as igneous or sedimentary and through the application of heat and pressure are transformed into new rocks or minerals. Common forms are marble, slate, and granites (Migmatite) with swirling/flowing patterns.

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Figure 1 - Marble a metamorphic form of limestone

Moh's Hardness Scale

Friedrich Mohs, a German mineralogist developed this scale in 1822 to classify the relative hardness of minerals. This scale applies a numerical rating from 1 to 10 with 1 being the softest for 10 minerals found in nature. The hardness of another mineral is determined by whether they scratch, or are scratched by the standard minerals on the Moh's Scale.

Moh's Hardness	Mineral	Common Forms
1	Talc	
2	Gypsum	
3	Calcite	
4	Flourite	
5	Apatite	
6	Feldspar	Granite
7	Quartz	Amethyst, Citrine, Agate
8	Topaz	
9	Corundum	Sapphire, Ruby
10	Diamond	

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What is Quartz?

Quartz is a pure mineral that has the chemical formula SiO_2 and is crystalline in structure. It has a Moh's Hardness of 7 and cannot exist in slab form in a pure state. Quartz is colorless in its pure form, but due to trace minerals, many colors are found in nature.

Figure 2 - Quartz Quarry

Figure 3 - Pure Quartz

Z-2002-23

What is Granite?

Granite, is not a mineral, but is a combination of Feldspar, Quartz, Mica, & various other minerals and rocks that provide the wide variety of colors. Granites vary widely in hardness, porosity, chemical resistance, and strength due to the infinite combination of minerals that makeup this general category of stone. Many products (commonly sold as granite) are in fact Migmatite, which is a metamorphic rock. Due to this, the Moh's hardness of common granites will range from the low 5's (Migmatite) to the upper 6's.

Figure 4 - Granite slab

Figure 5 - Migmatite Slab

Z-2002-23

What is Marble?

Marble is limestone (Calcium Carbonate) that has been subjected to heat and pressure causing the mineral to recrystallize and form the new mineral. Marble has a Moh's Hardness of 4 – 4.5 and is a metamorphic rock. Many products commonly represented as marble are in fact other varieties of rock, which have been classified by the building industry as marble due to the similar properties of the materials.

Figure 6 - Marble Quarry

Z-2002-23

What is Silica Sand?

Silica sand, in the pure form is chemically the same as Quartz, i.e. SiO_2. Silica sand, however, is rarely found in the pure form since sand found in nature is a combination of a variety of minerals, rocks, and other items such as broken glass. Silica sand, sometimes referred to as Quartz Sand or simply sand, is formed through the process of erosion. In general, sand particles are rounded in shape, are limited to small sizes, and contain a mixture of crystalline and amorphous (no structure) SiO_2. In addition, silica sand contains silicates, which are any of a group of minerals that contain Silicon, Oxygen, and one of many other elements such as iron, aluminum, Manganese, etc. For example, Mica is a type of silicate.

Figure 7 – Natural erosion of rocks & pebbles to form silica sand

In summary,

Quartz is a pure mineral, which has a crystalline structure and in the pure form has a clear appearance. Quartz found in nature comes in a variety of colors due to the presence of trace minerals. It has a Moh's Hardness of 7.

Granite is a type of rock mainly composed of a combination of Feldspar, Quartz, and Mica. Much commonly sold granite is Migmatite, which is not a pure granite, but a metamorphic rock and can be recognized by the swirling patterns in the material. Since granite covers a broad range of rock types, it is highly variable in structure, strength, porosity, and hardness. The Moh's Hardness can vary from the low 5's to high 6's.

Marble, Migmatite, and other metamorphic rocks are combinations of igneous/sedimentary rocks transformed through heat & pressure.

Silica sand, in its pure form is chemically identical to Quartz. However, pure SiO_2 rarely occurs in the form of sand in natural large deposits. Silica or Quartz sand is a mixture of crystalline and amorphous (no structure) SiO_2, a variety of silicates, various

types of rock (granite, marble, sandstone, etc.), as well as any variety of items such as glass and sea shells. Silica sand is the result of erosion where a variety of different rocks and minerals are physically ground down through the actions of wind, water, & changes in temperature. The end result is a mixture of small rounded particles, which contains a high % of SiO_2.