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Mohs' Hardness (Typical) of Abrasives

Material	Mohs' Hardness
Alumina (Synthetic aluminum oxide)	3.4
Aluminum oxide	9
Alundum (Fused brown Al203)	9.0
Amalgam	4 - 5
Anatase	5.5 - 6
Apatite	5
Barium sulfate	3
Boron carbide	9 - 10
Burundum	9+
Calcite	3

Chalk (calcium carbonate)	3
Chrysoberyl	8.5
Copper slag	7
Corundum (Natural aluminum oxide)	9
Crystolon (SiC)	9.0
Cuttlebone	7
Dentin	3 - 4
Diamond	10
Diopside	5 - 6
Emery	7 - 9
Enamel	5
Enstatite	5.5
Feldspar	6
Fluorite	4
Furnace slag	7
Garnet	6.5 - 7.5
Glass Bead	5.5
Glass (lead free)	7
Gold	2.5 - 3
Gypsum	2
Hematite	5.5 - 6.5
Kyanite	4 - 7
Magnetite	5.5 - 6.5
Olivine	6.5
Orthoclase	6

Petalite	~ 6
Plastic media	3 - 4
Porcelain, feldspathic	6 - 7
Pyrite	6.5
Pumice	6
Quartz (Silica sand)	7
Serpentine	2 - 4
Silica sand	6 - 7
Silicon carbide	9 - 10
Sillimanite	6 - 7
Soda (Sodium bicarbonate)	2.5
Specular hematite	7 - 7.5
Spinel	~ 8
Spodumene	6 - 7
Staurolite	7.0 - 7.5
Steatite (Soapstone)	1 - 2.5
Steel grit	RC= 42 - 62
Steel shot	8 or RC= 42 - 50
Strontium titanate	5 - 6
Talc	1
Topaz	8
Titanium dioxide, Anatase	5.5
Titanium dioxide, Rutile	6.5
Tungsten carbide	9
YAG	~ 8 1/4

Zinc sulfide	3
Zirconia	8
Zirconium silicate (Zircon)	6.5 - 7.5

Please refer to the READE Product Page of the material you are interested in.

Abrasive Definitions:

Abrasive blasting for surface preparation is an important step in providing a foundation for protective coatings. For years, tests have concluded that high-performance coatings provide excellent corrosion protection and durability when applied over a blast-cleaned surface with a consistent anchor profile.

In today's business climate, where so much importance is placed on quality assurance and environmental concerns, it's critical that plant personnel familiarize themselves with the characteristics of abrasives that are available. While no single abrasive can work in every application, there are many types and grades of abrasives available to fulfill most applications. Understanding the characteristics of each abrasive will help you pick the right one for the job and, in the process, help you run your plant more efficiently.

To determine the right one for a specific job, you must understand the basic definition of an abrasive: a substance used for abrading, smoothing or polishing. Abrasives can be naturally occurring minerals, man-made materials or by-products of another process. (A partial list of common abrasives is featured in the accompanying sidebar.) When choosing from this list, one must consider specific characteristics of the abrasive. They include hardness, shape, size, color, weight, chemical composition, availability, cost and environmental concerns.

Hardness

Hardness determines whether an abrasive particle can etch or provide an anchor pattern on a particular substrate. One way to determine the hardness of an abrasive is to use the Mohs' hardness scale. The scale ranges from 1 to 10, with 1 being the softest (talc) and 10 being the hardest (diamond). Most abrasives that effectively achieve an anchor pattern on a surface have a Mohs' hardness of at least 6.0. (http://www.e6.com/e6/page.jsp?pageid=600409530)

Mohs'

The Mohs' scale of hardness, devised by Friedrich Mohs, a German mineralogist in 1826, was originally based on the susceptibility of a material to be scratched. When adopted many ears ago, only ten known materials were listed. Talc, the softest, was numbered No. 1 and Diamond, the hardest, was numbered No. 10 with other materials falling in between. Since that time, calcined and hydrate alumina have been developed and their place on the Mohs' hardness scale has been approximated.

Some applications require softer abrasives ranging in the 3.0 to 4.5 scale range. They will not etch steel or glass, but will generally remove foreign debris and provide a clean surface. They are used in areas where the substrate's surface need not be removed, or where abrasive particle or residue could damage the substrate or surrounding area. Soft abrasives are often used around bearings and other easily damaged machinery.

Steel shot and steel grit are considered hard abrasives. Steel abrasives are measured in Rockwell C hardness. They are produced in hardness ranging from 42 to 65. Steel grit provides an etch on a steel substrate, whereas steel shot provides a peened surface on a steel substrate.

Shape

The shape of an abrasive may be angular, blocky, semi-round or spherical. An angular abrasive has sharp edges, which ensure the quickest cleaning rate when removing tightly adhering material or contamination from the substrate. The sharp edges of a hard, angular abrasive produce steep peeks and valleys in the anchor profile, thus increasing the surface area and providing an excellent condition for the mechanical bonding of a coating.

A blocky abrasive has mostly flat edges. This abrasive provides good cleaning rates in most applications, except those where hard-to-remove contaminants are present on the substrate. Semi-round and spherical abrasives produce a peened or dimpled surface. Blocky abrasives are generally used for surface hardening or stress relieving of the substrate.

Size

Abrasive particle size affects the cleaning rate and anchor pattern produced. Particle size is determined by U.S. sieve analysis, which distributes the particles in mesh sizes. (Abrasives are graded and packaged according to this method.) Abrasives are generally available from 4 to 325 mesh. The smaller the mesh size, the larger the abrasive particle.

A material graded 8 to 16 mesh is very coarse and is used for hard-to-clean surfaces or surfaces that require a deep anchor pattern. A material graded 20 to 40 mesh is considered a general-purpose abrasive. Eighty to 120 mesh is considered fine and is used for polishing surfaces. Round or spherical abrasives are graded by particle diameter. They are available in sizes ranging from 0.070 to 0.660 inches.

Abrasives should be graded to a uniform size. This allows for precise flow rates through a metering valve on a blast machine. Hard abrasives must be uniformly graded to provide a consistent anchor profile on the substrate.

Color

Color may not seem very important when selecting an abrasive. In certain situations, however, it is a critical factor. Abrasives can leave residue, which can affect the surface appearance of a blasted surface. Darker abrasives tend to be less dusty than lighter-colored abrasives because they do not reflect light as easily. This is especially important when blasting inside areas that require lighting. If blasting is performed in a manicured or tidy area where spent material cannot be completely removed, the color of the abrasive may be important for aesthetic reasons as well.

Density or specific gravity

The density or specific gravity of an abrasive affects the cleaning rate and anchor profile achieved on the surface. Density is measured in pounds per cubic foot; specific gravity is measured by the density of the particle relative to the density of water. An abrasive with a high specific gravity is generally heavier. When blasted at the same pressure, a heavy abrasive achieves a deeper anchor pattern than that from a lighter one. Abrasives with a high specific gravity tend to be less dusty. Those with a low specific gravity impact the substrate with less force and are used for light cleaning, polishing and deburring.

Chemical composition

Chemical composition must be considered to assure compatibility of the substrate with the abrasive. When blasting a substrate, particles may be embedded or leave a residue, which could damage the protective coating. In cases where an iron abrasive is used to blast a stainless steel substrate, the embedded particles

will form corrosion cells on the substrate.

Availability

It's important to ensure that the abrasive selected for a project can be easily obtained in sufficient quantities to finish the job. To obtain optimum results, it is best not to change abrasives in the middle of a project. Many abrasives are naturally occurring minerals or by-products from other industries. Therefore, they may not be available for immediate delivery in all geographical regions.

Cost

The cost of the abrasive is a critical part of any job. Often, the cost of freight to transport the abrasive from manufacturer to job site can determine your choice. Also important is its friability or breakdown rate. The cost of an abrasive that has a high recycle rate can be reduced substantially by reusing it in a blast cabinet or room with a reclaim system. The blasting pressure, hardness, malleability and size of the abrasive determine its recycle rate.

Environmental concerns

The final consideration is environmental. Environmental concerns include the abrasive's respiratory effects on the blaster and other workers in the area. Employees must be provided with approved respiratory equipment and monitored throughout the job.

When blasting in areas with poor ventilation, proper dust collection equipment must be provided to minimize worker exposure limits. The toxicity of junk being removed sometimes makes disposal of the abrasive/junk mix difficult. The effect of spent abrasive on the soil must also be considered. In confined areas, the toxicity of the abrasive may require the use of additional safety and engineering controls. Source (http://www.sspc.org/)

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