Grinding Wheel Basics

Sak Abrasives

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Contents

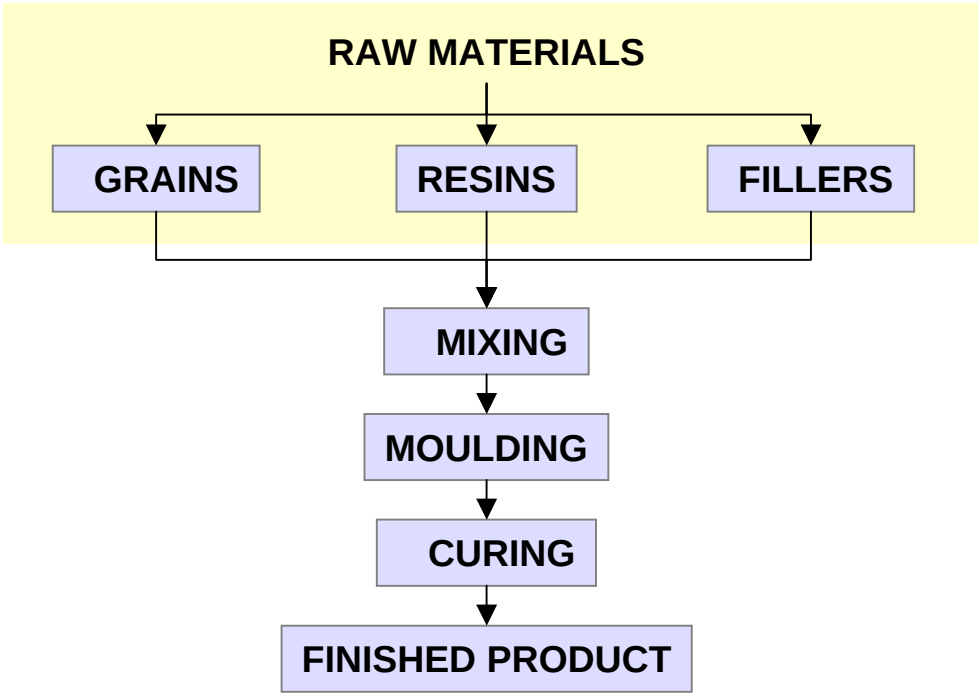
1. What is a grinding wheel

A grinding wheel is a cutting tool having thousands of sharp abrasive grains on the face of it, which do the cutting action.

- *It is used to remove material from a workpiece in an abrasive action*
- *Each grain acts as a cutting tool*
- *It is only self-sharpening cutting tool*

2. Components of a grinding wheel

- **Abrasive grains** - which do the cutting action.
- **Bond** - which holds the abrasive grains when they do the cutting action and release the grains when they become dull or blunt.
- **Structure** - the void between adjacent grains to provide chip clearance



3. Wheel Identification System

Wheel Dimension : 180 X 7 X 22.2

Specification : 1A 24 R BF

1A – Aluminum Oxide
C- Silicon Carbide
ZA – Aluminum Zirconia
CA – Aluminum Oxide & Silicon Carb

Grain Size
14,16,20, 36,46 etc.
Larger numbers are finer

BOND HARDNESS
A to Z indicating increasing hardness
Most resin bonds are in “O” to “U” range.
Sub no. indicates an open or closed structure. Higher nos. are more open.

Bond Type
B – Resin Bond
V – Vitrified Bond
R – Rubber Bond

F: Fibre glass reinforcement

4. Bonded Abrasives

TYPE OF BOND	SYMBOL	CHARACTERISTICS / SUITABLITY
Vitrified	V	Made from glass, clay, feldspar under heat fusion. Wheels using this bond have a porous structure with high elasticity, making it suitable for high stock removal and precision grinding applications.
Resinoid	B	Made from phenolic type plastic or resins, resinoid wheels are tougher and are less rigid than vitrified wheels, making them ideal for high operating speeds/heavy duty operations.
Rubber	R	Made of both natural and synthetic rubbers, it is used mainly in centreless and control wheels for applications demanding high precision and fine surface finish.
Shellac	E	Made of both natural and synthetic shellacs, wheels made from this bond have exceptionally cool cutting properties and well suited for grinding soft materials.
Oxychloride	OXY	Magnesium oxychloride is used as a bond in very limited wheels, especially for its cool cutting property even without any coolant.

5. Grains

- Aluminum Oxide - White
- Aluminum Oxide - Pink
- Aluminum Oxide - Brown
- Silicon Carbide – Green
- Silicon Carbide – Black
- Aluminum Zirconia

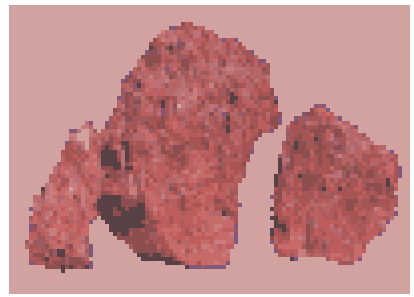
5. Grains

Aluminum Oxide

- It is the primary metal grinding and cutting grain because of its toughness and durability.
- Works well with most ferrous metals and stainless steels.
- Most of the depressed center wheels are made out of Aluminum Oxide.

White Aluminum Oxide

Brown Aluminum Oxide

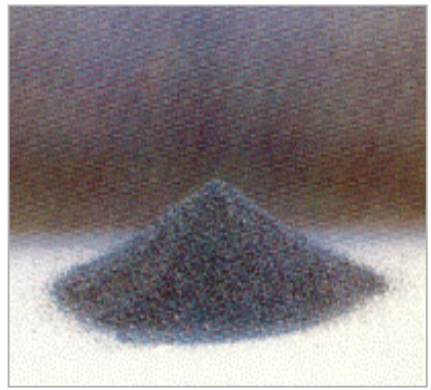


Pink Aluminum Oxide

5. Grains

Silicon Carbide

- It is the primary masonry and non-ferrous cutting and grinding.
- It is sharper than Aluminum Oxide but is more brittle.
- All concrete and masonry cutting wheels are made of silicon carbide.
- It is also used to cut or grind non-ferrous metals like aluminum and C.I. materials
  - BLACK SILICON CARBIDE is used for heavy duty snagging, cylindrical, centerless and internal grinding of brass, rubber, cast iron and ceramics.
  - GREEN SILICON CARBIDE is ideally suitable for tungsten carbide tools and also for rolls of chilled iron and glass grinding.



Black Silicon Carbide

5. Grains

Aluminum Oxide Zirconia

- It is a re-fracturing grain where the individual grain particles break during use to present new cutting edges.
- Aluminum Zirconia offers longer life and faster cutting on ferrous and stainless steel.
- More expensive grain but offers faster material removal.

Aluminum Oxide Zirconia

6. Grain Size and Grade

Grain Size

Very Coarse	Coarse	Medium	Fine	Very Fine
6	12	30	70	150
8	14	36	80	180
10	16	40	90	220
8	20	46	100	240
	24	50	120	280
	54			320
	60			400
				543

Grain Grade

Very Soft	Soft	Medium	Hard	Very Hard
E	H	L	P	T
F	I	M	Q	U
G	J	N	R	
	K	O	S	

7. Wheel Hardness

- Wheel hardness is the term that refers to how tightly the resin material holds on to the grain particles.
- A hard Bond is one that is very strong, and does not release the grain quickly, thereby providing longer wheel life.
- A soft bond is one that releases the grain quickly to expose new grain particles to the work piece.
- Hard Wheel lasts longer but may not cut faster (they are used to grind/cut soft materials)
- Soft Wheel cuts faster and smoother but does not last long. (they are used to grind/cut hard materials)
- Selection of the wheel hardness is directly related to power of the tool. Low powered tools need soft wheels while high powered tools require harder bonds.

8. Types of Wheels

- Cylindrical grinding wheels.
- Centerless grinding wheels.
- Off hand grinding wheels.
- Surface grinding wheels.
- Internal grinding wheels.
- Tool room grinding wheels.
- Dressing / honing sticks.
- F- type grinding wheels.
- Flute grinding wheels.
- Control / regulating wheels.

9. Shapes of Wheels

- Plain / straight wheels
- Cylindrical wheels
- Wheels with recess
- Straight cup wheels
- Tapper cup wheels
- Saucer wheels
- Dish wheels
- C' face wheels
- Depressed centre wheels
- Cut - off wheels
- F' type wheels
- Wheels with special shapes

10. Industrial Applications

- Bearing industries.
- Automobile - such as pistons , piston rings, gudgeon pins, crank shaft , and cam shaft.
- Defence units
- Foundries and steel plants.
- Machine tool / cutting tool manufacturers.
- Razor blade industries.
- Coal fields.
- Railways.
- Surgical needle manufacturers.
- Cycle manufacturers.