

HOW TO CLASSIFY REFRACTORY MATERIALS

The best method to classify the refractory materials is on the basis of their chemical behavior, i.e. their reaction to the type of slags. Accordingly we have three categories of Refractory materials: Acid, Basic & Neutral. Apart from these we can classify refractories into few more categories like - Special refractories, Insulating Refractories, & Cermets.

What are Acid Refractories

Acid refractories are those which are attacked by basic slags. These are not affected by acid slags and hence, can be safely used where the environment is acidic. Examples of acid refractories are:

1. Silica (Most acidic).
2. Semi - Silica.
3. Alumino - Silicate Refractories.
 - a) High Alumina (exception, for they react with basic slags).
 - b) Fireclay groups e.g. LHD (Low Heat Duty), HHD (High Heat Duty), SD (Super Duty), High Grog.
 - c) [Kyanite](#), [Sillimanite](#), Andalusite.

Kyanite - Mineralogy and Indian Occurrences [\[Read\]](#)

Sillimanite - Mineralogy and Occurrence in India [\[Read\]](#)

Here in case of Fireclay bricks one thing to be kept in mind is that the higher the percentage of Al_2O_3 the higher is the fusion point & greater is the resistance to basic slags.

What are Basic Refractories

Basic refractories are those which are attacked by acid slags. Since they do not react with basic slags so, these refractories are of considerable importance for furnace linings where the environment is basic for example, in furnace for non-ferrous metallurgical operations. Examples of basic refractories are:

1. Magnesite.
2. Mag - Chrome.
3. Chrome - Mag.
4. Dolomite.
5. Forsterite.

What are Neutral Refractories

These are the refractories that are neither attacked by acid nor by basis slags. Examples are:

1. Graphite (Most inert).
2. Chromites.
3. Artificial refractories like - Zirconium Carbide, Silicon Carbide (depending on the amount of oxidation & type of bond in the material, it reacts with basic slags to form an acid refractory)

Out of these Graphite is the least reactive and is extensively used in metallurgical furnaces where the process of oxidation can be controlled.

Special Refractories

These are expensive refractory materials which have been manufactured using synthetic (Fused / Sintered) grains free from impurities, under highly controlled production parameters.

They are used for special purposes like - construction of crucible, some parts of furnaces and, R

& D purposes etc where the cost of the refractory is of no consideration. They include materials like -

- Pure Alumina
- Sialons (Si - Al - O - N)
- Thoria (ThO₂)
- Beryllia (BeO)
- Zirconia
- Boron Nitride
- Spinel etc.

Insulating Refractories

These are high porosity refractories with low thermal conductivity used in order to reduce the rate of heat flow (heat losses) and thus to maximize heat conservation within the furnace. With high energy costs has come the development and application of a wide variety of insulating refractory materials. These refractories are produced from China clay, Asbestos (Kieselguhr), Glass wool, Mica (Vermiculite), Bubble alumina, Carbon, Paper wool, Ceramic fibers, Saw dust etc.

Cermets

Under this category come the refractories produced from the mixtures of high purity Refractory Oxides, Carbides, Borides, and Metals or Alloys. Depending on the compositions and quality they are suitably used as abrasives (cutting, grinding, boring tools), in parts of Spacecrafts, Missiles, Atomic Power Plants etc.

Source : <http://viewforyou.blogspot.in/2008/09/how-to-classify-refractory-materials.html>