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Calcium Aluminate Cement

IRC-40

General Characteristics

Portland cement used in civil construction work contains lime-silica compounds as the principal component. In refractory cement which also called Alumina cement or Calcium Aluminate cement, lime-alumina compounds form the principle component.

Alumina cement forms calcium-aluminate hydrates and alumina hydrate (AH_3) by reacting with water while Portland cement forms calcium silicate hydrates and free lime [$\text{Ca}(\text{OH})_2$]. Thus in alumina cements AH_3 and not $\text{Ca}(\text{OH})_2$ forms. Which accounts for the suitability of alumina cement as a refractory material.

Method of Manufacture:

Refractory IRC40 cement is produced by melting mixed raw materials (Bauxite and lime) in special furnaces and then, produced clinker is finely ground in order to provide reactivity with water, strength and install ability.

Mineralogical Composition:

C = CaO A = Al_2O_3
 S = SiO_2 F = Fe_2O_3

* Principal mineralogical phase:

Monocalcium aluminate-CA

* Secondary phases:

C_{12}A_7 , C_2AS , C_4AF

Packaging:

In common with all hydraulic binders, IRC-40 must be stored in dry conditions, off the ground. When correctly stored, the shelf life of IRC-40 is at least 6 months. In most cases, its properties are retained for over a year.

The following are properties of alumina cement:

- 1- IRC40 Cement resists high temperatures (up to 1300°C with appropriate aggregates). It is particularly suited to the construction of kilns, fireplaces and barbecues.
- 2- The setting time of IRC40 cement is equivalent to that of ordinary Portland cements. However, it hardens much more rapidly. Its properties at 24 hours are equivalent to those of Portland cement at 28 days. Consequently valuable time can be saved on the building site. Form work can be removed from load bearing structures 24 hours after placing.
- 3- Due to its rapid hardening properties, IRC40 cement liberates heat allowing concrete to be placed in cold weather down to -10°C .
- 4- IRC40 cement is resistant to many aggressive agents: sea water, acidic and sulphated waters, pure water and acids with a PH down to 4.
- 5- Concrete made with IRC40 cement and suitable aggregates provides a very high resistant to abrasion and impact. It is well adapted for industrial flooring and for highly trafficked areas.
- 6- The fast hydration of calcium aluminate concrete will lower the water content to below 3% within 48 hours. By comparison, Portland cement concrete will typically take several weeks to achieve this value. This is important when we intend to coat concrete surface with epoxy resin, adhesives or cover it with paste or tile without considerable delay.

Chemical Compositions & Physical Properties:

	Al_2O_3	SiO_2	CaO	Fe_2O_3	TiO_2	MgO
Specification Limit	> 35 %	< 6.5 %	< 41 %	< 19 %	< 5 %	< 1.5 %
Usual Range	37 – 40 %	4 - 5 %	37 – 39 %	15-18 %	< 4 %	< 1 %

	Usual Range	Specification Limit
Residue at 90 microns:	< 5%	
Fineness (as measured by Blaine apparatus):	2900 – 3200	> 2700 Cm^2/gr
Bulk density:	1150 kg/m^3	
Specific gravity:	3.2 – 3.3 g/cm^3	
Refractoriness (PCE) on neat cement paste:	1280 $^\circ\text{C}$	
Initial set (by Vicat needle):	180 - 240 min	> 120 min
Compressive strength after 24 hours:	550 - 700	> 450 kg/cm^2