## ABSTRACT

[ **KEY WORDS** : Aluminium, Aging time, Antioxidant, Basic oxygen furnace, Compaction, Curing of resin, Forming pressure, Gradings, Graphite, Metallic additives, MgO-C refractories, Novolac resin, Oxidation mechanism, Oxidation reaction rate model, Oxidation resistance, Porosity, Phenol formaldehyde resin, Resol resin, Pitch, Particle size distribution, Silicon, Slag corrosion resistance, Shell layer control, Wear mechanism ]

Magnesia carbon bricks having different amount of graphite and additives are used in Basic Oxygen Furnace (BOF). In this work systematically MgO-C compacts containing different amount of graphite have been made and their oxidation and slag corrosion behaviour have been studied.

Magnesia and graphite particles were mixed together with phenol formaldehyde (PF) resin using different particle size distribution represented by Andreasen equation. Depending upon the mould size, maximum particle size was selected by optimizing.

Three major groups of PF resins are indigenously available and they have different viscosities and other properties. Best combination of resins have been selected

based on optimum bulk density (BD) and cold crushing strength (CCS). Effect of mix storage time was studied with respect to BD and CCS.

From literature different curing schedules are available but systematic study in this area have not been reported. Different curing schedules have been studied and optimized for getting maximum compressive strength.

Then it was planned to prepare different amount of graphite containing MgO-C specimens. As packing behaviour of graphite is different than magnesia, same particle size distribution is not suitable for getting maximum density. For each level of graphite , packing density were measured by tapping apparatus and optimum gradings were selected.

In slag corrosion, carbon plays an important role by restricting depth of slag penetration. But carbon is depleted due to oxidation. Oxidation behaviour and amount of graphite plays a major role in improving slag corrosion and thermal spalling resistance.

Effect of temperature on oxidation behaviour of 20% graphite containing MgO-C specimens were studied. Carbon produced from liquid binders provides strength at high temperature and therefore their oxidation behaviour were studied with rise of temperature as well as at $1000^{o}C$. Oxidation behaviour of 4 different varieties of graphites were studied to select the best one. Effect of porosity on

oxidation was studied at 1200$^{o}$C. Oxidation studies were then conducted with MgO-C specimens containing different amount of graphite at 1200$^{o}$C to find out optimum level of graphite. Effect of addition of different amount of metal powders ( Al and Si) on oxidation behaviour of 10% graphite containing MgO-C specimens was studied at different temperatures.

Slag corrosion studies were conducted with different amount of graphite containing samples at 1650$^{o}$C with holding time of 15, 30, 45 minutes. Remaining slag volume and slag penetration thickness were measured to study the extent of corrosion. Another set of experiments were conducted at 1600, 1650 and 1670$^{o}$C with holding time of 15 minutes to see the effect of temperature. Corrosion behaviour of Al and Si metal added samples were studied at 1650$^{o}$C (15 min).

To understand the mechanism of slag corrosion , slag-refractory interface were studied in detail with optical microscope, SEM with EDAX and EPMA. Slag-refractory interface of used brick from BOF was also studied. Based on these studies wear mechanism of MgO-C has been proposed. Finally , optimum level of carbon, additives, gradings , binder etc have been suggested.