Development of Dolomite Blocks: A Brief Survey

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***Abstract*: In present scenario, dolomite brick/block is the most important stable refractory under the working conditions of Argon Oxygen De-carbonization (AOD). A positive permanent linear change (PLC) dolomite brick/block has higher life and most suitable for joints less refractory lining with no cobble stoning defects. So the development of dolomite bricks having positive permanent linear change during applications is a change for refractory manufacturing industrys. In the present investigation, dolomite refractory bricks were prepared by having different additive with an intention to get the positive permanent linear change of the brick. As we know, that Iron Oxide is a good additive for dolomite brick sintering. It has also been reported that monoclinic zirconia (m-ZrO_2) additive improves the BD, CCS and PLC of dolomite brick. In this background, first trial composition was containing a fixed amount of 1% m-ZrO_2 and different concentration and types of iron oxide. Mill scale containing Fe_2O_3 was added in two different concentrations 0.5%, 1% and in another trial 0.25% of nano Fe_2O_3 was added. Fe_2O_3 containing bricks showed a good improvement in BD and CCS due to the better sintering of dolomite grains in presence of liquid formation during sintering by the presence of Fe_2O_3.The CCS value was in the range 750-800 kg/cm\$^2$. However, the PLC value was negative in the range of -0.2 to -0.35%. Depending on this result, new additive, Chrome Green oxide was used. It has been found that the permanent linear change (PLC) tends to be positive with increase in Cr_2O_3content.**

***Keywords*: Dolomite, PLC, Iron oxide, cobble, concrete.**

INTRODUCTION

Dolomite is a double carbonate of calcium and magnesium ($CaCO_3$, $MgCO_3$). It is one of the important raw material used in iron & steel, ferroalloys, glass, alloy steels, fertilizer industry etc. Dolomite chips are also used in flooring tiles.There are a number of unique properties in dolomite brick that make dolomite well suited for use as a refractory lining in a cement rotary kiln. A high degree of refractoriness allows the dolomite brick to withstand the temperatures and stresses involved in the burning zone, the corrosion resistance to alkalis and a reducing atmosphere, as well as excellent coatability [11-14]. Finally, the environmental safety of the used materials is outstanding properties of the dolomite brick. Dolomite is a magnesium limestone ($CaMgCO_3$). It occurs in nature. Calcined dolomite brick particles are united with the help of silicate bindersand wax. Mixture is then molded to bricks which are air dried and burnt to temperature ranging between 1200 to 1560°C for about one day which gives stabilized dolomite bricks. Such bricks are quite stable towards basic slag

II. LITERATURE SURVEY

Dolomite is a double carbonate of calcium and magnesium ($CaCO_3$, $MgCO_3$). It is one of the important raw material used in iron & steel, ferroalloys, glass, alloy steels, fertilizer industry etc. Dolomite chips are also used in flooring tiles [24].
The specifications of dolomite required for different industries are given below:
Iron and Steel Industry: Dolomite is used in iron and steel industry as refractory raw material. The ISI (Is 10346&1982) has prescribed the specifications of dolomite for use in the manufacture of refractory blocks, fettling material and for the blast furnace and sintering plants.
Ferro-Manganese Industry: The specifications of dolomite for use in ferromanganese are more or less similar to SMS grade dolomite . Physically dolomite should be hard and fine grained because crystalline dolomite gives fritting effects. Ferro alloy industry actually consumes dolomite with MgO 19 to 20%, CaO 28 to 30% $Si0_2$ 2 to 5%, and Al_20_3 2 to 2.5%.
Glass Industry: High grade dolomite with as low iron content as possible is required by the glass industrys. Glass grade dolomite is typified by its purity and consistency. The MgO and CaO content should not very by more than 0.5%. The chief undesirable impurities are iron followed by chromium, manganese, vanadium, lead, all of which colour the glass or they may cause defects in the glass.
Fertilizer Industry: Dolomite for use in fertilizer industry must have $CaCO_3$ +$MgCO_3$ 90% (min) and SiO_2 5% (max).Inferior grade dolomitic limestone of 15-20% MgO can be used as soil conditioner. Ground dolomite, 50% of which must be 100 BS mesh size be considered suitable as a soil conditioner if it is applied at the rate of 2-3 ton per acre.The ISI (rs: 5407 - Part 2-1985) has prescribed the specifications of limestone and dolomite to be used as soil amendments.

CONCLUSION

It has been reported that Iron Oxide (Fe_2O_3) plays an important role in Dolomite refractory's . It is establish that Fe_2O_3 helps in liquid phase sintering of dolomite, which results in a good densification of the brick. For that reason, the CCS increases with Fe_2O_3 addition due to the increase in BD, decrease in AP. This in turn improves the hydration resistance. As well as Fe_2O_3containing liquid, which forms during sintering solidify as a coating upon the Dolomite grains. This coating again improves the hydration resistance . In this background, the first trial composition for the present study was composed of Fe_2O_3containing additives.Our target was to get positive PLC of the brick. The references also stated that the Fe_2O_3 containing dolomite brick will

not produce shrinkage during PLC firing because the brick is already highly densified.

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[8] On p.41 of part 3 of his book "Systema naturae per regna tria naturae etc." (1768),. This is as hard as quartz, but it is different in that it does not, unless after a few minutes, effervesce with "aqua forti"".