

Project Title: Development of Magnesia Galaxite bricks for Cement Rotary kiln.

DST has sanctioned the above project Vide letter No.DST/TSG/Ceramic/2008/53 dated 02.07.2010 and the project cost was Rs 26.81 lacs. This is a joint project sanctioned to M/s Dalmia Institute of Scientific & Industrial Research, Rajgangpur, M/s Insitute of Minerals & material Technology, Bhubaneswar and M/s OCL India Ltd. Rajgangpur

Objective : To develop Magnesia Galaxite bricks using fused Galaxite ($MnO.Al_2O_3$) for application in Cement Industries.

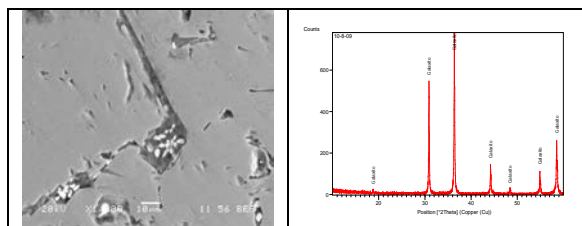
Introduction:

Rotary kiln is used as the main equipment for the production of Portland cement. Generally Magnesia Chrome bricks are being used in the burning and transition zone of rotary kiln. Chromite poses a great environmental problem due to its carcinogenic nature. To overcome this problem scientists have been working to develop alternative refractory materials. Out of various alternative materials, Magnesia-Galaxite brick is one which can replace Magnesia Chrome brick for use in the burning and transition zone of cement rotary kiln, due to its thermo-elasticity property and compatibility with molten cement clinker. Galaxite is a spinel group of mineral which is not available in nature and it is synthetically prepared by sintering as well as fusion route in EAF. In this project magnesia galaxite bricks has been developed by using synthetically prepared fused galaxite through plasma fusion route.

Deliverable:

1. Development of a laboratory scale process for preparation of fused Galaxite ($MnO.Al_2O_3$) through plasma fusion route.

In this project a process has been developed to prepare Galaxite through plasma fusion route and the physical, chemical and mineralogical properties of fused galaxite is given below.



SEM of Galaxite

XRD pattern of Galaxite

Properties Of Fused Galaxite Grains

A.P %	4.1
B.D (gm/cc)	3.76
XRD Analysis	
Major Phase	Galaxite
Crystal Size in micron	
Maximum	200
Minimum	10
Average	50
Glassy phase	Present
Chemical Analysis	
Al ₂ O ₃ %	58.7
MnO %	38.9

2. Development of a process for making of Magnesia Galaxite brick for application in cement rotary kiln.

In this project a process has been developed to prepare magnesia galaxite brick after optimizing the different parameters. The properties of developed bricks are mentioned below.

Properties of developed Magnesia Galaxitebricks

	Achieved	Target
A.P(%)	16.5	15 -17
B.D(gm/cc)	2.94	2.8 -3.0
C.C.S(Kg/cm ²)	815	600-900
RUL ta	1700°C+	> 1650 ⁰ C
Spalling Resistance (950°C/Air)	125	> 100
XRD analysis		
Major	Periclase	
Minor	Galaxite	
Chemical analysis		
MgO%	88.5	89 -92
Al ₂ O ₃ %	4.8	3-5
Fe ₂ O ₃ %	0.6	< 1
MnO %	3.2	2 -3

Conclusion :

It is possible to prepare fused galaxite through plasma fusion technique.

It is possible to make Magnesia Galaxite bricks using fused hercynite. The physical, chemical and thermal properties of developed product are almost matching with the target value.

The spalling resistance, corrosion resistance and clinker adhesibility properties of developed product are better than Mag-chrome bricks and can replace Magnesia Chrome bricks for application in the burning zone of cement rotary kiln.