

Project Title: Development of Magnesia Hercynite bricks.

DST has sanctioned the project Vide letter No.DST/TSG/Ceramic/2007/24 dated 19.03.2010 and the project cost was Rs 18.24 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 Hercynite bricks using fused hercynite ($\text{FeO} \cdot \text{Al}_2\text{O}_3$) for application in Cement Industries.

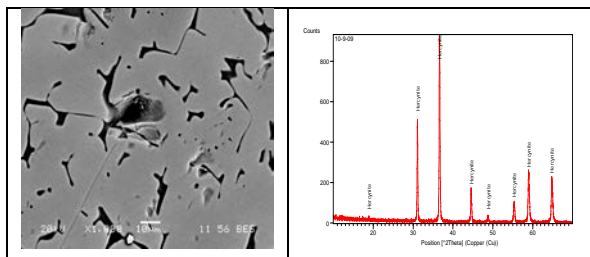
Introduction:

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-Hercynite 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 hercynite bricks has been developed by using synthetically prepared fused hercynite through plasma fusion route.

Deliverable:

1. Development of a laboratory scale process for preparation of fused Hercynite ($\text{FeO} \cdot \text{Al}_2\text{O}_3$) through plasma fusion route.

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



SEM of Hercynite

XRD pattern of Hercynite

Properties Of Fused Hercynite Grains

A.P %	2.4
B.D (gm/cc)	3.89
XRD Analysis	
Major	Hercynite
Crystal Size in micron	
Maximum	200
Minimum	10
Average	70
Glassy Phase	Present
Al_2O_3 %	58.1
FeO %	39.4
MgO %	1.5

2. Development of a process for making of Magnesia Hercynite bricks.

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

Properties of developed Magnesia Hercynite bricks

	Achieved	Target
A.P(%)	16.5	< 20.0
B.D(gm/cc)	2.97	> 2.85
C.C.S(Kg/cm ²)	523	> 500
RUL ta	1700°C	> 1650°C
Spalling Resistance (950°C/Air)	120	> 100
Thermal Expansion at 1000°C	1.26	1.0-1.2
True Specific Gravity	3.768	3.6-3.8
XRD analysis		
Major	Periclase	
Minor	Hercynite	
MgO%	87.8	87 -92
Al_2O_3 %	4.5	4-5
Fe_2O_3 %	4.3	3-5
CaO%	1.8	< 2.0
SiO_2 %	0.6	< 1.0

Conclusion :

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

It is possible to make Magnesia Hercynite 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.