Preparation and study the general characteristics of the heat insulation for Iraqi bentonite clay.

Receved : 21/10/2015 **Accepted :26/1/2016**

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Abstract:

High performance thermal insulators industries is recognized as one of most significant industries worldwide. This of course ,due to its basic role in industries requiring elevated temperatures .In this research,we used the Iraqi bentonite clay,and due to the low alumina content in these clay, as shown by analysis , has resulted in lowering both the softening and melting points .It is planned in this research to study the effect of soaking time and added alumina on improving physical and thermal properties of bentonite samples .Certainly,the better properties of the insulator will result in more effective towards resisting the elevated temperature, affecting other properties.

Keyword: Thermal insulators**,** Iraqi bentonite clay, Refractories, Insulators bentonite.

Comical Classification QC 170 - 197

Introduction: 1-

Many believe that the ceramic is onlypurity and distinct specifications of electrical, those materials used in ceramics and healthmagnetic, chemical and thermal properties . equipment industry, but the ceramics used inTherefore used this type of ceramic is used in this area is currently only being a traditionalParts Industry for Microelectronics, computer, ceramic industry. These include cement andReactors, parts of the turbine engines and glass industries and the Refractories used forspace materials[2,3]. The greatest expansion in thermal insulation of furnaces as well asinsulator size happens when the proportion of porcelain and Tile[1]. In view of theAlumina (70-75%), this the the expansion due importance of the use of ceramics forto Mullite which build fine layer surrounded advanced technological the need required thethe fine- corenduom grains. The expansion presence of new types with properties andprocess which corresponding to Mollite specifications not exist in the traditionalbuilding will decrease the mechanical ceramic, these new types called modernresistance and increases the amount of slag ceramic which consists of Alumina Oxide andwhich resultin increasing the porosity of Silica.These new types of ceramic with ahighmaterial [4].

Experimental procedure:- 2-

1-2- Materials and Methods :

By taking different samples of Iraqi bentonite clay of different combinations during the laundering of the solution with distilled water to remove salts from the samples and then dried with temperature up to (100^0C) for (24 hr).

2-2- Chemical analysis:

The chemical analysis of the Iraqiof Industray and Minerals. The result of the bentonite clay samples have been done by wetanalysis is showr in the Table(1).
method in Iraq geological survey/ Ministry

Material oxide	Bentonite (wt %)
SiO_2	52.60
Fe_2O_3	9.07
Al_2O_3	30.24
CaO	3.49
MgO	2.78
SO_3	0.34
Na_2O	1.10
K_2O	0.5
Cl	0.40
L. O. I	0.38

Table (1) the Chemical analysis

3-2- **Metallic Analysi**

solution .Table (2)shows the result of the Iraqi bentonite clay .

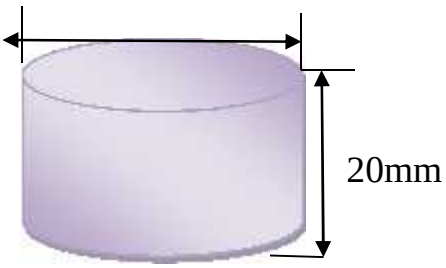
of the Iraqi bentonite clay metal analysis of Iraqi bentonite clay have been done know the minerals in the samples and phases of the

Table (2) the Metallic analysis of the raqi bentonite clay.

Minerals	Percentage%
Clay minerals	**85.4**
Non-clay minerals	**14.6**

these processes [5]. After that we produced sample in a manner of Semi dry method,by adding (10%) of water and (5%) Mall of(The former Mixture)to previous miting, the content by using hydrolic Dress of (30 N/mm^3) with loading speed (10 mm/min).The resultant sample have cylindrical shape with height (20mm) and diameter (20mm).These dimension are consistent with the German specification standared DIN-51053.The of the sample is show in the Figure(1).

A metal analysis of Iraqi bentonite clay were done by using X-ray diffractometer (Philip PW1410120),where the device supplied with cu-target and the wave length of the X-ray beam is ($1.541A^0$). As well as the analysis of the Differential Thermal Analysis(DTA) of Iraqi bentonite clay were done by using(philips(PW)1253) analysis to identify the thermal behavior of this crude (clay) during heating or cooling processes due to for chemical and physica changes cooresponding the



Figure(1) sample after pressing.

Then,place the sample in the oven at the temperature ($70C^0$) for (1hr),then raised the temperature ($120C^0$) and leaving the sample at this temperature for (24hour). Depending on the results (DTA) for Iraqi bentonite clay,and from the observation and checking the changes on the

clay,we can choose suitable temperature among (1000-1500) C^0 to achive and complete the incineration process, and completed the incineration in an programmable oven and even to ($1500C^0$).

3-Results and discussion :-

From the results of chemical analysis for Iraqi bentonite clay as show in table(1),we can see the low percentage of Aluminum oxide in bentonite clay that used in produary the in sulator sample,so we suggest in our research adding the Alumina oxide to the mixture to improve the general specification of production,these suggestions and results are consistent with [6].

From the results of Metallic analysis as show in table(2),we suggest and choose a mixture that contain a moderated percentages of fleable medium to get a clear impact and acceptable time-bound maturity and temperature.

Figure(2) shows the effect of Aluminum oxide perceufage and temperature on the linear expansion of the prepared sample. From the figure,we can see clearly the effect of Alumina oxide,and these result can be attributed to special properties of Alumina oxide where the melting temperature equal to ($2050C^0$) and thats mean, the materials are not affected by within the limits of the low temperatures,and do not diffused inside the vacanic as and the absorbance of the water, while,the properties like density and qualitative weight were decreased. Also,the increasing of Alumina oxide percentage will decrease of silicon oxide in the mixture

Figure(3) shows the effect of Alumina oxide percentage and temperature on the bulk density. From the figure,we can show the drop in weight change and bulk density with increasing of Alumina oxide in the mixture and reducing of temperature of burning,these result is consistent with [7].

Figure(4) and figure(5) shows the effect of Alumina oxide percentage on the specifc gravity and porosity.From the figure we can show the reducing of specifc gravity with increasing of the Alumina oxide,while,the porosity of matter increased with increasing of Alumina oxide[8]. These behavior can be interpreated as the add of Alumina oxide have a hish effect on the proportion of phase transformation especially as the temperature is not hish enough,and do not increase of ($15.00C^0$). Indeed, the action that happen here is reducing of proportion of liquid phase due to reducing of chemical interactions between oxides that contan the mixture, and thats lead to increase the propability of survival part of oxide without interactionwith excistance excess of Alumina[9,10

Figure(6) shows the relation between the porosity of matter with the thermal conductivity after adding Alumina with different temperature[11]. From the figure we can see the decreasing of the value of thermal conductivity with increasing of the porosity which increasing with of Alumina percentage as shown in figure(5).The values of thermal conductivity at atemperature ($15.00C^0$) as shown figure(6) are greater than the values at($1400C^0$), these results can be attributed to increase of the rate of phase interactions which increasing with increasing of temperature and thats lead to reducing of porosity and conductare coefficient with hish dgree[12].

Conclusion:-

From the chemical examination of raw materials and local ceramic under study of the Iraqi bentonite clay ,we can conclude that these material is the most appropriate material for the production of the suggested. These conclusion canbe attributed to high proportion of Alumina in these material in comporsion with local raw materials.We concluded from (DTA) analysis to identify absorbing interactions and disseminators and heat of the interaction. From these analysis we determined of the optimum. production after studing of the changing the time of maturation,the flexible material proportion and graen size distribution on the general of properties of the produced samples.In Compartion the results of all the sample, we found that the properties have a noticeable changes even fof the time of maturation,where we found that the time equal (2 hr) and above this time,we notice the properties are fixed or slightly change. So,they are taken this time for temperatueres (1400-1500) C^0.

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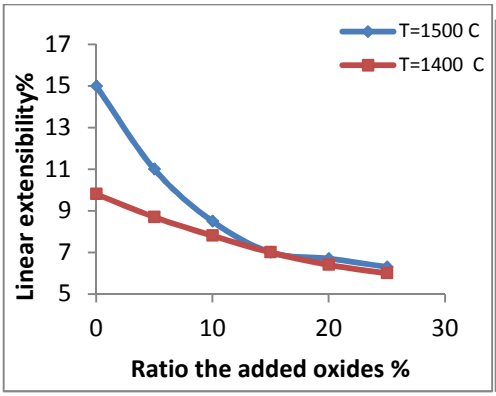
Table(3) shows the percentages of improved sampl alumina

Specific Gravity		Bulk Density(gm/cm^3)		Ratiothe added Oxide %
T=1400^{0}C	T=1500^{0}C	T=1500^{0}C	T=1400^{0}C	
3	2.7	3	2.8	0
2.7	2	2.5	2.2	5
2	1.4	2	1.7	10
1.5	0.8	1.6	1.3	15
1.2	0.4	1.2	1.1	20
1	0.1	0.8	1	25

Table (4) shows the results of the general properties of the mixture at (1400-1500^{0}C)

Porosity%		Thermal Conductivity(W/m.C^0)	
T=1400^{0}C	T=1500^{0}C	T=1500^{0}C	T=1400^{0}C
13	12	2	1.8
21	17	1.8	1.5
27	25	1.6	1.3
32	29	1.4	1.1
37	34	1.1	1
42	37	1	0.8



Figure(2) shows the effect of the proportion of aluminum oxide the linear and the temperature on expansion.

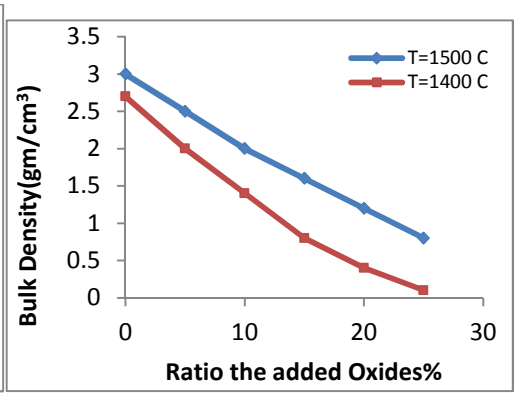


Figure (3) shows the effect of the proportion of aluminum oxide and the temperature on The Bulk density.

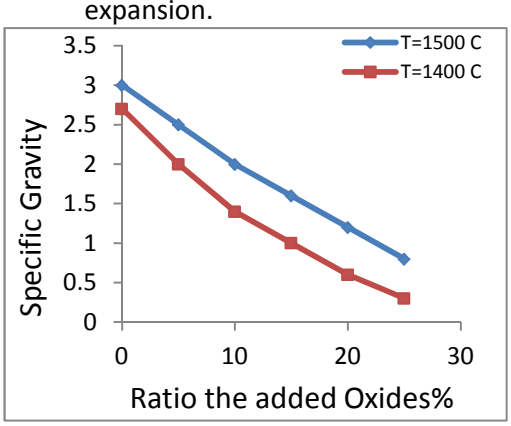


Figure (4) shows the effect of the proportion of aluminum oxide and the temperature on the specific gravity.

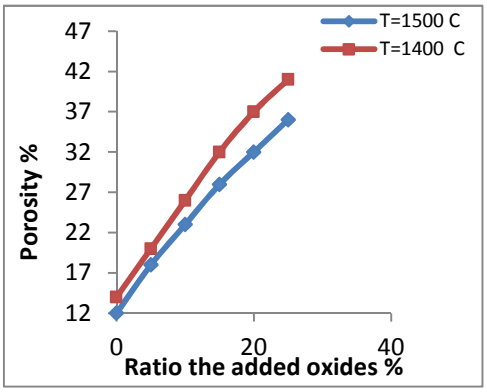


Figure (5) shows the effect of the proportion of aluminum oxide and the temperature on the on the porosity.

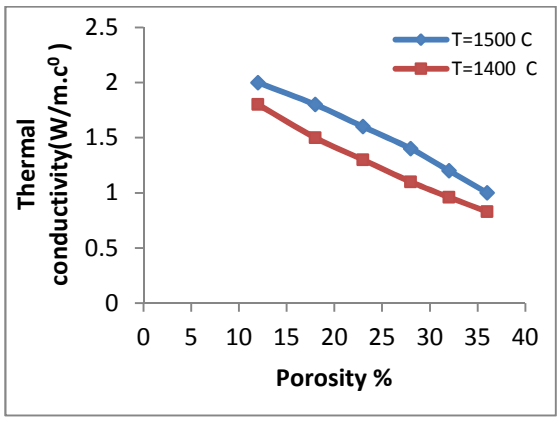


Figure (6) shows the relationship between porosity and thermal conductivity at different temperatures.

تحضير ودراسة الخصائص العامة للعزل الحراري من خلال طين البنتونايت العراقي .

تاريخ الاستلام 2015/10/21 تاريخ القبول 2016/1/26

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الخلاصة :

تعتبر صناعة العوازل الحرارية ذات الكفاءة العالية. واحدة من أهم الصناعات العالمية لأنها الأساس الذي تعتمد عليه الكثير من الصناعات التي تتطلب التعامل مع ارتفاع درجات الحرارة العالية. حيث تم في هذا البحث استخدام طين البنتونايت العراقي وبسبب نسبة الالومينا المنخفضة في هذا الطين ووفقا للتحاليل التي أجريت عليه فقد أدى بذلك إلى تخفيض درجة تليينه وانصهاره . ولذلك فأننا سنقوم في هذا البحث بدراسة مدى تأثير زمن الأنضاج ونسبة الألومينا المضافة على تحسين مواصفات طين البنتونايت العراقي (الفيزيائية , الحرارية) والتي تنعكس بالتأكيد على قابلية إداء العوازل وبالتالي تجعلها أكثر كفاءة تجاه الحرارة العالية دون التأثير على الخواص الأخرى.

الكلمات المفتاحية: العوازل الحرارية , طين البنتونايت العراقي , تحسين طين البنتونايت .