Effect of Milted Clay Brick Powder on Properties of Clay Brick with Additional of Silica Fume

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Abstract

This investigation is conducted to study the effect of adding of the milted clay brick powder(MCBP) with the admixture silica fume (SF) on the properties of clay brick. All specimens of bricks were made from al_furat factory soil . three levels of addition were used for (MCBP) ,(2%,4%,and8%by weight of dry soil)and three levels of addition were used for (silica fume),(3%,6% and 9% by weight of dry soil). All specimens were mixed ,molding and placing by hands with special mold. The experimental results showed that the increasing of addition (MCBP) without silica fume increases of compressive strength about (5%,11%and15 %) and decreases water absorption about (4%,5% and13 %) and decreases efflorescence about (5%,11% and20%) when three levels of addition were used for (MCBP) ,(2%,4%,and8%by weight of dry soil) respectively in clay brick, but the silica fume addition causes decreases in compressive strength and increases in the absorption of water and efflorescence phenomena in clay brick.

الخلاصة

ان هذا البحث يهدف الى دراسة تأثير اضافة مسحوق الطابوق الطيني المنصهر (MCBP) مع المضاف غبار او مسحوق السليكا (SF)على خواص الطابوق الطيني كل نماذج الطابوق صنعت من تربة معمل الفرات استخدمت ثلاث نسب اضافة من مسحوق الطابوق الطيني المنصهر (MCBP) وهي (2%,4%and 8% من وزن التربة الجافة) وثلاث نسب من المضاف من مسحوق السليكا (SF) وهي (3%,6%,9%)من وزن التربة الجافة كل النماذج خلطت وقولبت ووضعت بواسطة الايدي وبواسطة قالب خاص للنماذج .النتائج العملية اظهرت ان الزيادة بإضافة (MCBP) يزيد مقاومة الانضغاط حوالي (5%,11%,15%)ويقلل امتصاص الماء بحوالي (4%,5% and 13%)و يقلل ظاهرة التزهر بحوالي (5%,11%and20%) عند استخدام ثلاث نسب اضافة من مسحوق الطابوق الطيني المنصهر(MCBP) وهي (2%,4%and8%من وزن التربة الجافة) بالتوالي في الطابوق الطيني ولكن المضاف (SF) السيليكا عند اضافته يؤدي الى تقليل مقاومة الانضغاط وزيادة الامتصاص للماء وكذالك زيادة ظاهرة التزهر في الطابوق الطيني.

Introduction

In many countries, the need for locally manufactured building materials can hardly be overemphasized because there is an imbalance between the demands for housing and expensive conventional building materials coupled with the depletion of traditional building materials . Brick it is one of these material.in this research the (milted clay brick powder) which product from crushed milted clay brick (MCBP) and (silica fume powder) (SF)used as admixture to study the effect of it on properties of bricks.The good soil for the production of bricks clay must contain the acceptable ratio of clay minerals with plasticity appropriate to provide a property profile appropriate during the stage of industry **(Sinawi, 1973)**, and must also be contained on the materials annealed in limited quantity and appropriate, such as sand for the purpose of reducing the contraction winning when drought and avoid the emergence and growth of cracks of poetry and provide paths for the exit of gases during the stages of manufacturing bricks in the stage of pride in the oven and contained also a sufficient proportion of oxide of iron and oxides alkaline for its influential role in the provision of state fusion of early **(Grimshaw, 1971)**. There are many researchers took the study of bricks and the effect of admixtures on the clay bricks. Mention some of them such as:

(Emmanuel A. Okunade, 2008) investigated The effect of the addition of sawdust (for burning out) and wood ash admixtures to a 70:30 parts by weight laterite-clay mix. It was

discovered that the major contribution of the sawdust admixture is the reduction in the dry density of the finished burnt brick product (from 1755 kg m-3 for the control mix without admixtures to 1512 kg m-3 for mix with 10% sawdust content). The wood ash admixture, in line with its pozzolanic nature, was able to contribute in attaining denser products with higher compressive strengths, higher softening coefficients, lower water absorption rates, Increasing contents of sawdust in the mixes produced the opposite results in the finished products.

(Al- Khafaji and AL- Rubbaai,2009) studied the effect of addition of Date seeds dust (DSD) on Properties of clay bricks . The engineering properties of produced brick were investigated with two situation (no burnt dust) and (burnt dust). The results illustrate that the addition of no burnt added material lead to a increase in water absorption and an efflorescence, while the density and the compressive strength were decreased . Results with burnt dust showed that the increasing in water absorption and decrease in efflorescence , density and compressive strength except at percentage (5) , It decreased the efflorescence clearly

(Xie Min et al , 2011)studied The production of common sintered brick by using waterworks sludge and fly ash as major raw materials with the addition of feldspar powder and quartz sand. The apparent natures. The results indicate that 60%-70% of waterworks sludge can be used to produce common sintered bricks. The water absorption is about 20% and the compressive strength is higher than 20MPa.

(Yang Yonggang et al ,2011) studied Making Fired Bricks with Gold Tailings by press forming. The results indicated that the optimum technology system was: forming pressure 15MPa, forming water content 8%~9%, water content before sintering 1%, sintering temperature 1050^{o}C, holding time 60 minutes. By applying this treating methodology, the compressive strength of the brick with 75% fine tailings and 25% medium tailings can reach MU10.

(Zhou Saijun , 2011) investigated an experiment on making autoclaved sludge fly ash bricks with reference to the technology of making autoclaved fly ash bricks. The test results show that the compressive strength decreases with the increase of sludge content, and the flexural strength increases slightly with lime content increased..

(Cui Chunxia, 2011) studied application of fly ash in production of wall material such as sintered brick, unfired brick, insulating heat brick, block and foamed Glass was summarized. The results show that application of fly ash in production of wall material has the characteristic of simple in process, good effect and lower cost. And this process has expansive application foreground. The problems remained and researches need to do in the near future were pointed out. And others have used chemicals and other materials **(Stevanov, 1977)** , **(Al-Saleem et al ,1985)**and **(samer et al, 1999)** to study their effect on the properties of clay bricks.

Experimental work

In the present work, study the effect of milted clay brick powder on clay brick with and with out of addition of a silica fume (20%water by wt.of dry soil) was used to mix with soil which brought from Al- Furat factory , homogenous mixture of soil and water was put in special mold. To make specimens of clay brick by a two layers,each layer was compacted at (50 blow) by square wood road which (1.5inch) in side.Three specimens for each addition ratio of the (MCBP)and (SF).The identification of each group of clay brick

specimens were summarized in table (1) .the crushed (MCBP)was put in a Loss Angelus device to obtain of very high fine powder (dust)for mix it with soil .all specimens after molded were exposure to air (for 14 days) in purpose of the perfect drying .the molds used in this study were (7*10*20 cm) in dimensions to obtain clay brick specimens for (compressive strength , absorption and efflorescence test) for each group .after the naturel drying ,the specimens were taken to (Al-Furat Brick Factory) to exposure for a high temperature at1000°C roughly ,Finally after the clay brick specimens are ready ,They were tested by (compressive strength ,absorption and efflorescence)in the construction materials laboratory .

(Table -1) Clay Brick groups characteristics

Symbol	(MCBP)content* %	(SF)content * %	No.of specimens
M0	0		3
M1	3		3
M2	6		3
M3	9		3
S31	3	2	3
S32	3	4	3
S33	3	6	3
S61	6	2	3
S62	6	4	3
S63	6	6	3
S91	9	2	3
S92	9	4	3
S93	9	6	3

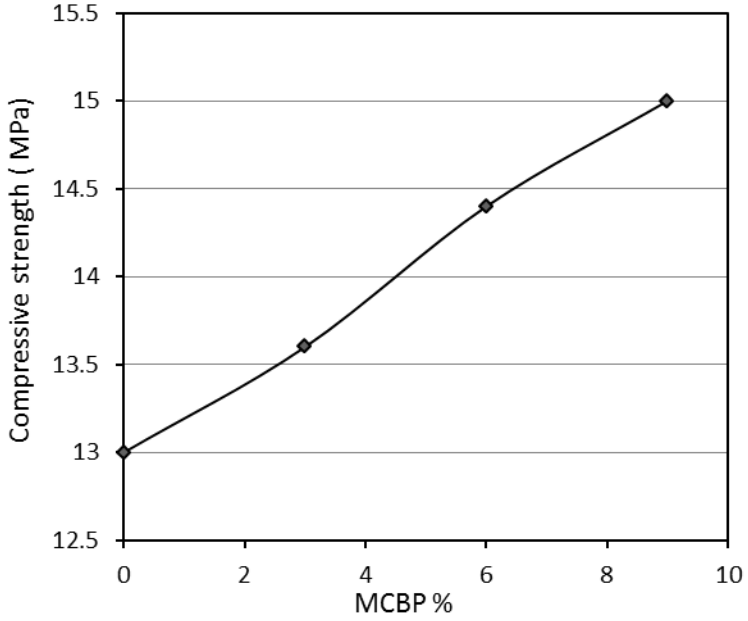
*(by wt. of dry soil)

Results and Discussion

Tables(2,3,4) and figures (1,2,3) show the effect of (MCBP) on compressive strength and absorption and efflorescence of clay brick .The test results show that the increasing of (MCBP) increase the compressive strength especially of level (9%) ,this increasing was about 15 percent ,also it can be seen that the addition of (MCBP) reduces the water absorption and efflorescens phenomenon .The reasons of that results are due to for particles of melting chemical elements in (MCBP) which made high bond in burnt mix core of clay brick and block any opening or path in brick mass.

Table(2) compressive strength test results when (MCBP) is used

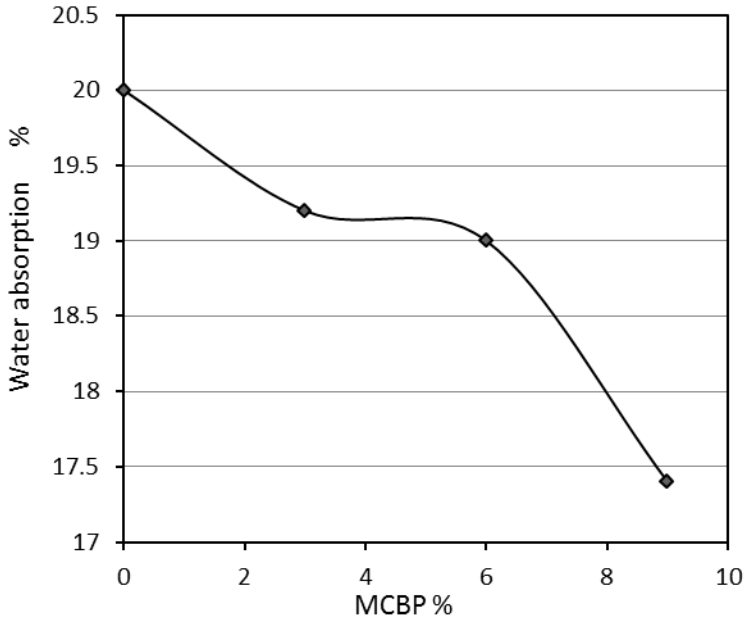
symbol	(MCBP)%by wt.dry soil	Compressive strength (MPa)
M0	0	13
M1	3	13.6
M2	6	14.4
M3	9	15



Fig(1) Effect of (MCBP)On compressive strength of clay brick.

Table(3) water absorption test results when (MCBP) is used

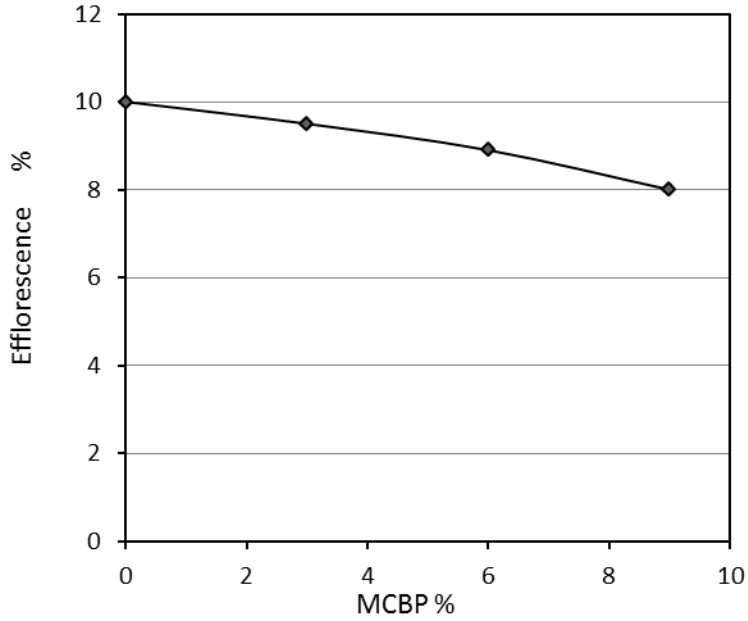
symbol	(MCBP)%by wt.dry soil	Water absorption%
M0	0	20
M1	3	19.2
M2	6	19
M3	9	17.4



Fig(2)effect of(MCBP)On water absorption of clay brick

Table (4) efflorescence test results when (MCBP) is used.

symbol	(MCBP)%by wt.dry soil	Efflorescence %
M0	0	10
M1	3	9.5
M2	6	8.9
M3	9	8



Fig(3)effect of (MCBP) on efflorescence of clay brick.

The result of compressive strength and water absorption and efflorescence when (MCBP) and (SF) were used together are listed in tables (5,6,7) and figures (4,5,6) .from these tables and figures it can be noticed that the addition of (MCBP) with (SF) for clay brick specimens causes reduces in compressive strength and increasing in absorption and efflorescence. This results are due to from negative effect of addition for silica fume ,whereas its chemical action is construct of fine fissures lead to a weakness for a particles bond in brick mass.

Table (5)compressive strength when (MCBP)and (SF) are used.

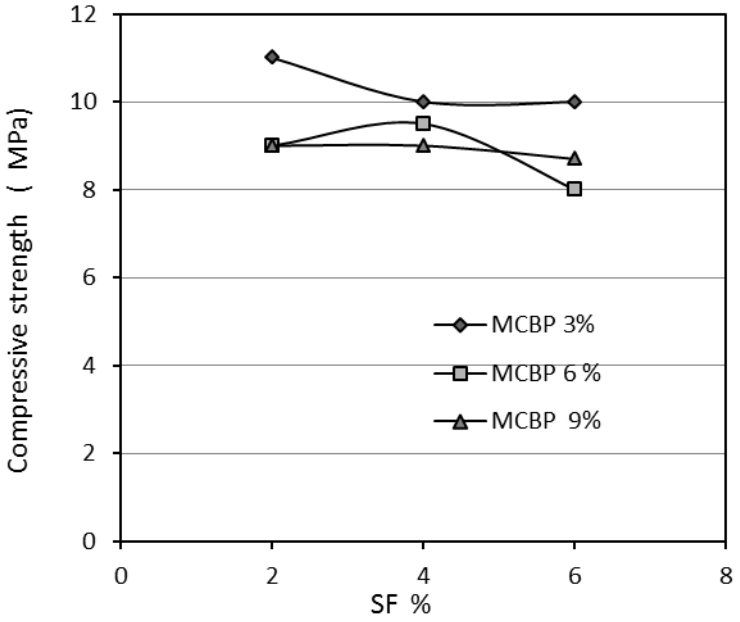
Symbol	(MCBP)%	(SF)%	Comp.str.(MPa)
S31	3	2	11
S32	3	4	10
S33	3	6	10
S61	6	2	9
S62	6	4	9.5
S63	6	6	8
S91	9	2	9
S92	9	4	9
S93	9	6	8.5

Table (6)water absorption when (MCBP)and (SF) are used.

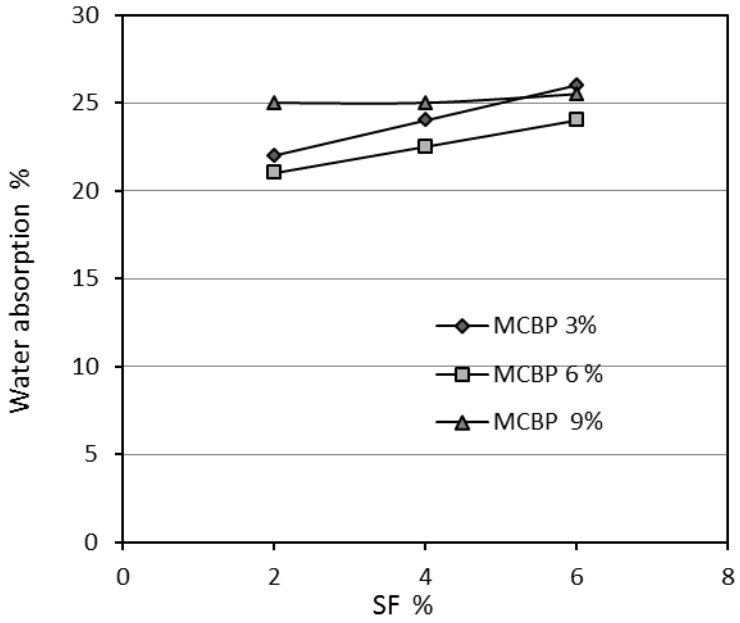
Symbol	(MCBP)%	(SF)%	Water absorption%
S31	3	2	22
S32	3	4	24
S33	3	6	26
S61	6	2	21
S62	6	4	22.5
S63	6	6	24
S91	9	2	25
S92	9	4	25
S93	9	6	25.5

Table (7)Efflorescence when (MCBP)and (SF) are used.

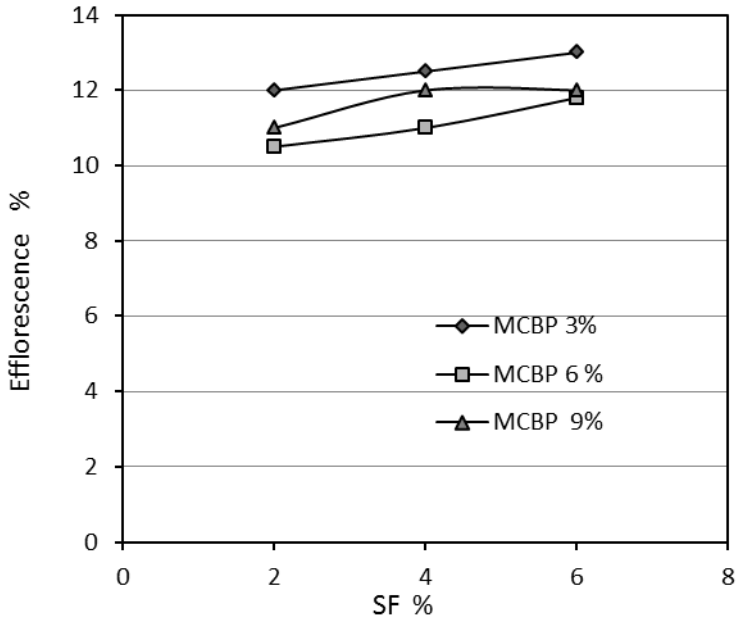
Symbol	(MCBP)%	(SF)%	Efflorescence%
S31	3	2	12
S32	3	4	12.5
S33	3	6	13
S61	6	2	10.5
S62	6	4	11
S63	6	6	11.8
S91	9	2	11
S92	9	4	12
S93	9	6	12



Fig(4) Effect of (MCBP) and (SF)On compressive strength of clay brick.



Fig(5)effect of(MCBP) and (SF)On water absorption of clay brick



Fig(6)effect of (MCBP) and (SF) on efflorescence of clay brick.

Conclusions

1.compressive strength of clay brick increases with addition of (MCBP) when it use with out of the admixture (SF).

2-Efflorsence and water absorption decreases with adding of (MCBP) when it use with out of (SF) but its increases when (SF) is added with (MCBP) in clay bricks.

3-compressive strength decreases when(SF) and (MCBP) are used together in clay bricks .

4-any increasing for (MCBP) contents with out of (SF) are increasing of compressive strength for clay bricks .

5-effect of addition of (silica) for clay brick causes hair line cracks in brick faces.

Recommendations.

1. Effect of milted clay brick powder on properties of clay brick with additional (silica flour) replacement of (silica fume) .
2. study of using of milted clay brick powder as admixture with super plasticizers in making of mosaics tills.

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