Mechanical properties of translucent cement under the action of sodium sulfate and magnesium sulfate

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Abstract: This study is a study of Mechanical properties of translucent cement under the action of sodium sulfate and magnesium sulfate. The objectives of the study are: 1. to find the appropriate ratio to obtain a cement substitute for high compressive strength welding. The ratio of epoxy resin (translucent material) can be obtained at the lowest cost. 2. To study the influence of the electric oven energy curing condition on the compressive strength properties and physical properties corrosion resistance, both acid and base. 3. To study the feasibility of capping gypsum and resin that qualifies for construction work. From the property analysis and to estimate the duration of using capping gypsum and epoxy resin (Translucent material) cured by electric oven and room temperature conditions, it was found that the optimal ratio for obtaining the highest compressive strength cement replacement material was the by-weight ratio of epoxy resin of substance A and substance B is 100/60, baked at 80 degrees, soaked in water for 56 days to obtain a cement substitute for high compressive strength welding. The amount of water to be used mixed with high strength gypsum powder was 21%, duration 7 days, baked at 90 degrees and soaked in air. When considering the angle of use in construction instead of concrete, it was found that the most common ready-mixed concrete in the design of compressive strength ranging from 180-400 ksc and the most commonly used is 240 ksc cylinder. Therefore, when considered and found that Translucent cement under the action of sodium sulfate and magnesium sulfate. The compressive strength is between 200-800 ksc. General concrete work is mainly tested for the compressive strength. This is used to control the quality of work and can also be used as an indicator of other aspects as well. This is because the resistance to other forces is directly proportional to the compressive strength.

Keywords: Mechanical properties, capping gypsum, epoxy resin, sulfate

1. Introduction

At present, Thailand has researched to bring cement substitutes for bonding materials together which has researchers to research various types of materials, for example, limestone powder, silica powder, fly ash, etc. In concrete, the best known cement substitute for bonding is fly ash. The use of cement substitutes for bonding is deserving of support because it not only reduces the production cost in terms of material prices but also can reduce energy consumption in production especially. Using fuel to burn raw materials to produce cement directly in the displacement ratio, which has the effect of reducing the emission caused by combustion, for example, Carbon Dioxide (CO_2). Therefore, the use of renewable materials has the advantage of reducing production costs, save energy and reduces pollution. However, the problem encountered in cement bonding with the disadvantage is that when it hardens, it shrinks. Including the edge or corner will have less strength making it impossible to fully weld materials. Therefore, it can find alternative materials for bonding that are more efficient than cement.

Capping Gypsum is a gypsum powder with special properties. That is, when mixed with water, it can solidify within 30 minutes, and it can also give strength. It has compressive strength in the range of 5,000 ~ 9,000 psi (350 ~ 630 kgf / cm^2) in accordance with ASTM C617 / ASTM C39 / AASHTO T231. Nowadays, it is used to coat the surface of the ball for strength testing in the test chamber because it can harden within 30 minutes after mixing and have a smooth surface, therefore used to test as a bonding material instead of cement.

There are many types of epoxy resins (translucent material) available in Thailand. All of which are in the family of unsaturated polyester or is a type of plastic that is different from general plastics that come as pellets and then come melt into the mold into the bag into a trash bin, a chair that we use every day but resin is a liquid plastic. If it hardens into hard plastic then we cannot liquefy it to form a new plastic. Academics called resin a thermoset plastic and called general plastic that “thermoplastic”. The subspecies of resins that are available for sale will also have normal grades and stands for orthophthalic. It is the main resin that is widely used both in ordinary casting, transparent castings, glazes, water tanks, treatment tanks, bumper cars, clear sheets roof. Resins can be done in various forms, such as hand lay up, spray up, filament winding or infusion. There are many grades on the market next to ortho grades are iso grades, stands for isopthalic, they are more acid-resistant. Used in tank coating work or floor coating. That must be corrosion resistant and also used to make a non-fiberglass template to be more durable but if acid- and alkali-resistant resins that are even more thick and corrosive are needed, vinyl grades are abbreviated as vinlyester resin, which is both acid and alkali resistance. Highest among resins and has a higher strength than both ortho grades and iso grades too. In addition to being used to make tanks, pipes, floor coatings and wells that have to withstand high corrosion, it is also popular to make fiberglass templates for durability in use as well. The last one in use is epoxy grade epoxy resin, which is a grade that has a wide range of applications and formulas of various uses ranging from clear focus such as carbon bonnet, sticker coating, work about the strength used in fiberglass applications in the high-load areas, Such as pressure pipes, gas cylinders to focus on the bonding force For making glue as the resin with the highest strength but it's still inferior to vinyl grades in terms of corrosion resistance. Therefore, the idea is to use this Capping Gypsum as a substitute for cement that has a very high energy production process. It produces up to 0.5 ton of carbon dioxide (CO_2) for every tonne of cement produced. It is the cause of emissions that affect the greenhouse effect (Global warming) as much as 13,500 million tons per year, or about 7 percent of the total gas emitted in the atmosphere.

For this reason, it is the source of materials to replace the use of cement and nowadays, various materials have been invented to be used in the construction of home decoration to be beautiful with strength in itself. These materials have production processes that are least polluted to the environment. Therefore, an experiment was made to find a replacement material with the properties mentioned above. As well as can be utilized as well where epoxy grade resin that is strong and translucent, used to decorate construction such as translucent bathroom walls or translucent bedroom ceiling which can be welded into larger parts by using Capping Gypsum.

So, it is foreseeable that using capping Gypsum in bonding and resin (translucent material) by studying the compressive strength, which is an important property derived from the mixing ratio calculations including the curing conditions and resistance to corrosion, both acid and alkali. This is something that should be developed continuously in order to be used in the decoration in the construction work properly, beautifully and creates confidence in the construction industry.

2. Epoxy Resins

Epoxy resins are polymers with triangular circles. It consists of two carbon atoms and one oxygen atom attached to the end of the chain as shown in picture 1. This epoxy group is a location that is sensitive to link reactions. Epoxy has a wide range of properties. Depending on the molecular structure have good adhesion to various fibers such as glass fibers aramid fiber carbon fibers, etc., have a low shrinkage compared with other thermosets. Such as unsaturated ester and vinyl ester. It also has high strength, chemical resistance, high dimension stability, easy to form, although the production cost of epoxy composite is higher. Unsaturated polyester and vinyl ester and its applications at high temperatures were not as good as polyamide, but overall properties of excellent epoxies (Idthipol Jangchud, 2001: 33).

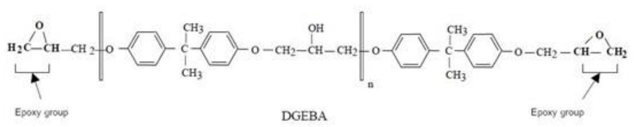

Figure 1: Chemical structural formula of epoxy (Diglycidyl Ether of Bisphenol A, DGEBA).

Source: Ellis, 1993: 3.

Curing Reaction of Epoxy Resins

The epoxy resin is converted into a thermoset by the reaction of epoxy groups which may react with itself to become a homopolymer or may react with substances link molecules (Hardening agent) in which the reaction may be either or both two things are fine.

Linking agent of epoxy resin

Epoxy linkers are generally divided into three groups: amine group, lewis acid group, and acid anhydride group.

Properties of Crosslinked Epoxy

Epoxy resins have groups that show specific properties. (Characteristic group) so large it is difficult to the synthesis to obtain the desired properties but epoxy has many curing agents to choose from. In order to obtain the product with the desired properties, it was also found that time, temperature and filler had an effect on product properties. Epoxy reactions involve molecular orientation in the absence of volatile substances from the system. The resulting product will have no problems with shrinkage or less shrinkage. The epoxy main skeleton has good thermal stability but the thermal stability also depends on the association. Therefore, the anhydride-linked system is thermally stable to approximately 200 ° c while the amine-linked system is thermally stable to approximately 150 ° c. will have treasure is a good insulator. It has a dielectric constant and high polarity resulting in good adhesion.

3. Gypsum (CaSO4 2H2O)

$CaSO_4 \cdot 2H_2O$), also known as Gypsum. It is a very brittle non-metallic mineral with a white color. Colorless or gray often have yellow, red, or brown color. It has a pearl-like luster or silk, Hardness 2, specific gravity 2.7, texture transparent to translucent. Different names are called according to the nature of the mineral content. Satinspar is a gypsum mineral with a burr. Alabaster type has a compact pellet mass and selenite (selenite), clear, colorless, mineral flesh, thin and transparent. It is caused by minerals that are precipitated in basins with very high and continuous evaporation causing the rest of the water to have a higher concentration. There is a point where the minerals called “evaporites” are able to precipitate in order of solubility. It generally starts with carbonates, sulfates, and halides. Thai gypsum ore formation has a small, tightly hermetic texture known as "alabaster", which is not caused by coagulation in the primary conditions of water evaporation but caused by adding water (rehydration) to the upper range of the anhydrite mass until change occurred. The gypsum species in Thailand has a rather complex history and the study of mineral deposits found that has been through changes in mineral types back and forth between gypsum and anhydrite (CaSO4) several times before the present condition.

Sodium Sulphite

Sodium sulfite may write sodium sulphite. Sodium Sulfite is water soluble sodium salt of sulfurous acid. The molecular formula is Na_2SO_3 to prevent the dried fruit from discolor and set aside rotten meat and use the same benefits as Sodium thiosulfate to replace halogen elements to hydrohalic acid to take pictures and reduce the chlorine level in the swimming pool. The sulfite group when heated, it decomposes to sulfur dioxide (SO_2) or sulfurous anhydride or sulfurous oxide. SO_2 is an acidic non-flammable gas and strong pungent smell suffocates. It is 2.264 times heavier than air, soluble in water and dissolved in water to sulfurous acid.

Magnesium sulfate

Sodium sulfate compounds and magnesium Sodium sulfate salt also known as "Sodium Sulfate" is a white powder. Magnesium sulfate salts also known as "Magnesium Sulfate” ($MgSO_4$) is a clear white crystal like MSG but larger particles.

Corrosion by sulfates

Sulfate salts in solution form can harm cement paste, mortar and concrete. Naturally, each type of sulfate has different water solubility. (CPAC Ready Mixed Concrete, 1993), that is:

1. Calcium sulfate ($CaSO_4$) dissolves only 1.2 g / l in water.

2. Sodium sulfate (Na_2SO_4) dissolves water 240 g / l.

3. Magnesium sulphate ($MgSO_4$) water dissolved 300 g / l.

Since calcium sulphate ($CaSO_4$) has very little water solubility, in the sulfate tolerance study, sodium sulfate (Na_2SO_4) and magnesium sulfate ($MgSO_4$) were used.

The mechanism of sulphate corrosion is due to the sulfate ions interact with calcium hydroxide ($Ca(OH)_2$) and tricium aluminate (C_3A) remaining by hydration action. This causes expansion in the hardened concrete until it cracks.

Corrosion mechanism by magnesium sulfate ($MgSO_4$)

Beginning with the reaction of magnesium sulfate ($MgSO_4$) with calcium hydroxide (($Ca(OH)_2$) obtained by hydration, gypsum and magnesium hydroxide ($Mg(OH)_2$) as equation (1)

$$Ca(OH)_2 + MgSO_4 \rightarrow \text{Gypsum} + Mg(OH)_2 \quad (1)$$

This reaction causes a decrease in the pH of the solution, which results in the absence of calcium silicate hydrate (CSH) by decomposition to increase the pH is higher as equation (2)

$$\text{C-S-H}_{(aq)} \rightarrow SiO2 + Ca(OH)_2 \quad (2)$$

It was found that this calcium hydroxide ($Ca(OH)_2$) reacts with magnesium sulfate ($MgSO_4$), causing the decomposition of calcium silicate hydrate (CSH). The hydroxide ($Mg(OH)_2$) comes from when magnesium hydroxide ($Mg(OH)_2$) reacts with SiO_2 in solution form magnesium silicate hydrate (MSH) which is not capable in bridging. Therefore, in this magnesium sulphate ($MgSO_4$) solution, the damage is more severe than in the sodium sulfate solution (Na_2SO_4).

Research method

This section describes the details related to conducting research. Contains materials research implementation plan and research methods which show the details as follows:

4. Material

1.1 Epoxy Resins. General use model (General Use) No. SB2B: suitable for needing about 2 hours of working time.

1.2 Capping Gypsum. In this research, type S-420 was used as a popular product of Capstone. Series S-420 features a high quality and high strength test material. It is the best and most reliable product made by many professional testing laboratories. The water to gypsum ratio for S-420 is 21 ~ 22%. After mixing with water for 30 minutes, the gypsum is fully solidified and its strength is greater than 420 kg / cm2 (6000psi).

1.3 Sulfate solution. Using a 5% sodium sulphate (Na2SO4) solution with a weight of 50 g / l and a 5% solution of magnesium sulphate ($MgSO_4$) with a weight of 42.36 g / l in accordance with ASTM C1012.

1.4 Water. Tap water with pH equal to 7.0 is used to prepare sulfate solution and mix Capping Gypsum.

Preliminary testing of the properties of epoxy resin and high strength gypsum

The physical properties of high-strength epoxy resins and gypsum studied in this study consisted of a normal test for solidity and testing the formation time. These properties are the basic properties used to test the properties of cement paste.

The mix proportions of high-strength epoxy resin and gypsum used to test physical properties in fresh conditions are described below.

1) The ratio by weight of epoxy resin of substance A and substance B is 100/40, 100/50, 100/60, 100/70 and 100/80.

2) The water content to be mixed with high strength gypsum powder is 20%, 21%, 22%, 23% and 24% by weight of gypsum powder.

The process for mixing epoxy resins used to test physical properties is described below.

1) Mix A and B according to the designed ratio together in the container.

2) Stir both substances together for 2 minutes to combine.

3) After that, put it into the module to test for the time of formation.

The process of mixing high strength gypsum used to test the physical properties is described below.

1) Mix gypsum powder with water. With a paddle speed 285 ± 10 rpm for 5 minutes.

2) The ready mix which was in the fresh state was tested for the time of formation.

Formation time test

To find out the time of formation using the vicat needle. Refers to the time period (Since when the sample is finished) that when the standard 1 mm diameter vicat needle is released into epoxy resin and high-power gypsum. The needle will sink 25 millimeters after 30 seconds of releasing the needle. If released without interference, high-strength epoxy resins and gypsum will lose their irreversibility and reach their immutable state without fracture. This transition is called the formation and hardening of high-strength epoxy resins and gypsum.

5. Study of the Influence of mix Proportions and curing conditions that affect the properties of epoxy resin and high strength gypsum.

Study the compressive properties and physical properties of the geopolymer paste mixed with dust. Refractory insulating bricks at various mix proportions which undergoes curing in an electric oven and at room temperature. To study the influence of mix proportions and curing conditions and to determine at what mix proportions and curing conditions make the samples both compressive and physical properties suitable for further study.

Mix Proportion

The mix proportions of epoxy resins and capping gypsum used in examining the influence of mix proportion and curing condition are detailed below.

Table 1: Mix proportions of epoxy resins for testing formation time

Sample set	Ratio by weight		Weight (g)	
	Substance A	Substance B	Substance A	Substance B
1) A40B	100	40	350	140
2) A50B	100	50	350	175
3) A60B	100	60	350	210
4) A70B	100	70	350	245
5) A80B	100	80	350	280

Table 2: Mix proportions of capping gypsum for testing formation time

Sample set	Ratio by weight		Weight (g)	
	Gypsum powder	Water	Gypsum powder	Water
1) G20W	100	20	650	167
2) G21W	100	21	650	250
3) G22W	100	22	650	333
4) G23W	100	23	650	133
5) G24W	100	24	650	200

Mixing and Casting

The mixing and casting procedures of epoxy resins and capping gypsum used in testing physical properties are detailed below.

Epoxy resins

1) Mix substance A and B together according to the determined ratios in the container.

2) Stir both substances together for 2 minutes so the matter combine as one.

3) After that, pour it into a mold shaped as a 5 cm cube.

Capping gypsum

4) Mix gypsum powder with water and left it for 1 minute, then stir with mixer blade speed at 285 10 rpm for 5 minutes.

5) Pour the mixed capping gypsum into a cylindrical mold that is 5 cm in diameter and 10 cm high. Separate the mixture into two layers, each jabbed with a steel pushrod according to the ASTM C109 standard.

6) Bring it into a shaker for 10 seconds to remove air bubble or pores inside.

7) Cover the sample surface by wrapping the mold with a clear plastic sheet to prevent evaporation of water during the reaction

5.3 Curing

When finish sample casting, samples are further cured via various methods. Moreover, curing epoxy resin and capping gypsum studied in this research is dry curing. This can be divided into two methods: (1) room-temperature curing and (2) curing in electric oven.

5.3.1 Curing at room temperature

When finished casting samples of epoxy resin and high-strength gypsum. The sample is incubated in atmospheric conditions at room temperature; samples are placed in a mold and covered with a plastic sheet, left at room temperature.

5.3.2 Curing in the oven

Samples placed in the formwork and covered with plastic wrap were left at room temperature for a period of 24 hours and then unpack the design. The curing was then cured in an electric oven at 50 ° C, 60 ° C, 70 ° C, 80 ° C and 90 ° C to study the influence of the pre-curing time and the appropriate heat to develop compressive strength.

5.4 Immersion in sulfate solution

The sulphate solution was prepared using 5% sodium sulphate (Na_2SO_4) solution by weight 50 g / l and 5% solution of magnesium sulphate ($MgSO_4$) by weight 42.36 g / l according to ASTM C1012 standard of epoxy resin and high-strength gypsum cured, yes, in such a solution. It was left for periods of 0, 7, 14, 28 and 56 days and weighed lost by the corrosion of the sulfate solution.

5.5 compressive strength tests

When curing samples of high-strength epoxy resins and gypsum and maturing in sulfate immersion. The samples were then taken to test for compressive strength according to ASTM C 109 (ASTM V.04.01, 2001) with Universal Testing Machine (UTM). 5.6 Other relevant features explore other properties of high-strength epoxy resin and gypsum cured at various conditions including Scanning Electron Microscope and Fourier Transform Infrared Spectroscopy.

5. Results

Results of the study of epoxy resin weight ratio of substance A and substance B

- At a period of 7 days that the maximum compression power is bake at 0 degrees, soak in sodium sulfate solution.

Example	wide (cm)	lengthy (cm)	height (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	Compression (ksc)
60%	4.71	4.75	5.10	22.37	135.4	136.7	18910	845.23

Found that the right ratio o obtain a cement substitute for high compressive strength welding. The ratio by weight of epoxy resin of substance A and substance B is 100/60.

- At a period of 14 days that gave the maximum compression power were bake at 90 degrees and soak in water

Example	wide (cm)	lengthy (cm)	height (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	Compression (ksc)
60%	4.78	5.07	5.00	24.23	139.2	140.8	21220	875.61

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The ratio by weight of epoxy resin of substance A and substance B is 100/60.

- At a period of 14 days that gave the maximum compression power, including bake at 70 degrees, soak in sodium sulfate solution.

Example	wide (cm)	lengthy (cm)	height (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	Compression (ksc)
50%	4.78	4.94	4.80	23.61	124.0	124.3	17790	753.39

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The ratio by weight of epoxy resin of substance A and substance B is 100/50.

- At a period of 56 days that gave the maximum compression strength, namely bake at 80 degrees in water.

Example	wide (cm)	lengthy (cm)	height (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	Compression (ksc)
60%	4.87	5.06	5.00	24.64	114.3	115.7	21600	876.55

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The ratio by weight of epoxy resin of substance A and substance B is 100/60.

From the above study, it was found that the ratio was appropriate to obtain the highest compressive strength of cement replacement materials, ie, the ratio by weight of epoxy resin of substance A and substance B is 100/60, baked at 80 degrees, soaked in water for 56 days.

The results of the study of the amount of water mixed with high-strength gypsum powder

- At a period of 7 days that the maximum compression power is Bake at 90 degrees in air

Example	wide (cm)	lengthy (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	ksc
21%	5.33	10.59	22.32	486.5	487.2	16290	729.80

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The amount of water to be mixed with high strength gypsum powder is 21%.

- At a period of 14 days that the maximum compression power is Bake at 70 degrees in air

Example	wide (cm)	lengthy (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	ksc
20%	5.30	10.73	22.07	497.4	496.1	13480	610.76

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The amount of water to be mixed with high power gypsum powder is 20%.

- At a period of 28 days that the maximum compression power is Bake at 70 degrees in air

Example	wide (cm)	lengthy (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	ksc
22%	5.26	10.63	21.74	474.8	473.5	13220	608.13

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The amount of water to be mixed with high power gypsum powder is 22%.

- At a period of 56 days that the maximum compression power is Bake at 70 degrees in air

Example	wide (cm)	lengthy (cm)	Cross-sectional area (cm^2)	before (g)	After (g)	Compressive strength (kg)	ksc
21%	5.32	10.15	22.24	455.7	454.1	13830	621.92

Found that the right ratio to obtain a cement substitute for high compressive strength welding. The amount of water to be mixed with high power gypsum powder is 21%.

From the above study, it was found that the ratio was appropriate to obtain the cement replacement material for high compressive strength welding. The amount of water to be used mixed with high strength gypsum powder was 21%, duration about 7 days, baked at 90 degrees and soaked in air.

The possibility of using capping gypsum and resin as the material of construction properties. The property analysis and estimation of the duration of using capping gypsum and epoxy resin (translucent material) can be cured in an electric oven at room temperature conditions.

Resin, also known as "polyester resin" is a type of plastic made from natural wood latex and chemically synthesized. The typical nature of the resin is a slurry that is yellowish, oil-like color or a fuchsia pink. However, it will depend on the chemicals used to mix it. Therefore, the resin has outstanding properties, namely toughness, high elasticity, heat resistance, weather resistance, weather resistance and gives beautiful colors .Therefore, resin is often used to make glue, perfume, jewelry ,the house number letters ,spare parts ,science photo frame coating ,production of fiberglass including casting into various shapes, such as casting monks, casting souvenirs, casting dolls, etc.

Generally, Capping Gypsum is a white, matt powdery that It has a strength of up to 5,000-9,000 psi (350-630 kgf / cm2) after 30 minutes of mixing with water. This type of gypsum is used as a capping material for concrete compression test according to ASTM C617 and AASHTO T231 standards. It is faster, safe and more economical as well as provides more accurate values compared to using sulfur or rubber pads. The purpose of cap cylinder sample is considered the angle of usage in construction as a substitute for concrete. It is found that ready-mixed concrete that is commonly used in the design of compressive strength ranging from 180-400 ksc and the most commonly used is 240 ksc cylinder in order to develop fully which it takes 28 days as a standard since the date of manufacture. Therefore, it was found that translucent cement under the action of sodium sulfate and magnesium sulfate. The compressive strength is between 200-800 ksc strength or strong resistance which is the most important property of concrete. There are many reasons, such as compressive strength, etc. General concrete works can be tested the bond strength and resistance to compression, etc. General concrete works mainly to test for compressive strength. This is used to control the quality of work and can also be used as an indicator of other aspects as well. This is because the resistance to other forces Is directly proportional to the compressive strength.

6. Conclusion

From the above study, it was found that the ratio was appropriate to obtain the highest compressive strength of cement replacement materials, ie, the ratio by weight of epoxy resin of substance A and substance B is 100/60, baked at a temperature of 80 degrees, soaked in water for 56 days. That's right To obtain a cement substitute for high compressive strength welding. The water content was mixed with high-strength gypsum powder was 21% for 7 days and baked at 90 degrees air, consistent with the study of Jacob, etal., 1995. The speed of the reaction speed of Microwave oven-treated methyl methacrylate (MMA) versus heat treatment that using a microwave at 2.45 GHz at a power level of 200, 300, 500 watts at different times as well as measuring the sample temperature. It was found that the microwave reaction rates of 200, 300 and 500 watts were similar to those of the heat treatment at 69, 78 and 88 ° c, respectively. The three temperatures of the heat treatment will have a higher reaction rate than that of a microwave oven at 200 and 300 watts because the temperature T of the epoxy is higher than the reaction temperature which caused the reactions that occur to be limited but the higher the wattage (500 watts), the higher the reaction temperature is equivalent to the heat treated temperature, thus the higher the reaction volume. In addition, it will increase with the same curing time as cement concrete. The compressive strength at 28 days of aging was higher than that at 7 days at every mixing ratio because the binder will separate before solidification. It also creates a water permeable gap and a small hole. All of these reasons lead to a decrease in compressive strength.

When considering the angle of usage in construction as a substitute for concrete, it was found that ready-mixed concrete that is commonly used in the design of compressive strength ranging from 180-400 ksc and the most commonly used is 240 ksc cylinder in order to develop fully , it takes 28 days as a standard since the date of manufacture. Therefore, when considered and found that translucent cement under the action of sodium sulfate and magnesium sulfate. The compressive strength is between 200-800 ksc strength or strong resistance. It was the most important property of concrete. There were many things as well, such as compressive strength and were tested for the bond strength and resistance to compression, including test for compressive strength. This was used to control the quality of work and can also be used as an indicator of other aspects as well. This is because the resistance to other forces Is directly proportional to the compressive strength.

7. Recommendations

In this research, the mechanical properties of translucent cement were studied under the action of sodium sulfate and magnesium sulfate, which, if further studies were carried out, the following interesting points could be considered as follow:

1. The infusion curing characteristics may be added to the incubation solution mixed with sodium sulfate and magnesium sulfate

2. The heat activation characteristics may be experimented with microwave oven curing or combined curing between electric oven and microwave oven.

3.May further research on the resistance of sulfate solution and apply from geopolymer mortar to concrete geopolymer and further to be reinforced concrete geopolymer, et.

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