



# บันทึกข้อความ

ส่วนราชการ..... คณะเทคโนโลยีอุตสาหกรรม

ที่..... วันที่..... 13 ก.ค. 2561

เรื่อง รายงานผลการไปประชุม/การอบรม/การสัมมนา/การศึกษาดูงาน  
เรียน คณบดี

ตามคำสั่ง/หนังสือ/บันทึกข้อความ ที่ 067/2561 ลงวันที่ 9 ก.ค. 2561  
ให้ข้าพเจ้า..... นส. ดร. อธิวัฒน์ อภิชาติธรรม

พร้อมด้วย.....

เดินทางไปประชุม/การอบรม/การสัมมนา/การศึกษาดูงานที่..... มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าฯ ICCM "2018"

เรื่อง การศึกษาวิจัยเรื่อง "Study of the mix cement properties of molar cement used in masonry and plaster from the waste pipe firing of area"

ระหว่างวันที่ 23 เดือน พ.ค. พ.ศ. 2561 ถึงวันที่ 25 เดือน พ.ค. พ.ศ. 2561

จัดโดย..... อ.พิเชษฐพงษ์ทองอินทร์ และ อ.ประพนธ์นาท

รวมเป็นเวลา..... 2 วัน

- อนุมัติให้ใช้งบประมาณ เป็นค่าใช้จ่ายในการเดินทางไปราชการครั้งนี้ จำนวน.....บาท
- ไม่ใช้งบประมาณ
- ใช้งบประมาณส่วนตัว

บัดนี้ การปฏิบัติหน้าที่ราชการที่ได้รับมอบหมายได้เสร็จเรียบร้อยแล้ว ข้าพเจ้าขอรายงานผลการไปประชุม/การอบรม/การสัมมนา/การศึกษาดูงาน ดังต่อไปนี้

1. 100 ชม. ในคณะเทคโนโลยีอุตสาหกรรม
2. ศึกษาในงานประชุม ICCM "2018"

ข้าพเจ้า จะนำความรู้ ความสามารถ ประสบการณ์ ทักษะ หรืออื่นๆ ที่ได้รับในการไปประชุม การอบรม/การสัมมนา/การศึกษาดูงานในครั้งนี้ มาเพื่อพัฒนางานของหน่วยงาน ดังนี้

1. ถ่ายทอดให้ ส.ส. ในจังหวัดสมุทร

2. ถ่ายทอดให้ ICIT ที่นครราชสีมา ในหัวข้อที่ ได้รับ of. 61

เอกสารที่ได้รับจากการไปราชการ/การอบรมสัมมนา/การศึกษาดูงาน มีดังต่อไปนี้ คือ

1. บันทึกไปราชการ 1300 นพพร 100 ICEN 2013

การเผยแพร่ความรู้ ประสบการณ์ ทักษะ และอื่นๆ แก่ผู้ที่เกี่ยวข้อง คือ

1. ดึงดูดไปอบรมที่ราชภัฏ นครราชสีมา

2. ถ่ายทอดความรู้ ให้ ส.ส. อ.นครราชสีมา และ ICIT  
อ.ร. 1300 นพพร 100 (ดร. จิ๋ว)

จึงเรียนมาเพื่อโปรดทราบและพิจารณาดำเนินการต่อไป

ลงชื่อ.....ผู้รายงาน

(.....)

ตำแหน่ง.....

ความคิดเห็นของหัวหน้าหน่วยงาน

ศาสตราจารย์ ดร. เสงี่ยมลักษณ์ เมืองมีศรี

ลงชื่อ.....

รองศาสตราจารย์ ดร. เสงี่ยมลักษณ์ เมืองมีศรี

ตำแหน่ง คณบดีคณะเทคโนโลยีอุตสาหกรรม

- หมายเหตุ
1. แนบสำเนาประกาศนียบัตร หนังสือสำคัญ หรือหนังสือรับรองการเข้ารับการฝึกอบรม สัมมนา/ประชุมทางวิชาการและเอกสารที่เกี่ยวข้องกับการฝึกอบรม/สัมมนา/ประชุมทาง วิชาการ ไปกับรายงานฉบับนี้ด้วย
  2. ส่งรายงานพร้อมทั้งเอกสารที่เกี่ยวข้องให้คณบดี ภายใน 7 วัน หลังสิ้นสุดการฝึกอบรม, ศึกษาหรือดูงาน, ประชุมเชิงปฏิบัติการหรือการสัมมนา
  3. กรณีไปนำเสนอผลงานวิจัย/ผลงานวิชาการ หรือการได้รับการตีพิมพ์ในวารสารต่างๆ ขอให้จัดส่งไฟล์งาน (Proceeding จากการตีพิมพ์, วารสาร/ปก, เนื้อหาในส่วนตีพิมพ์ มายัง e-mail: kannika.sroy@vru.ac.th

# Study of the mix cement properties of mortar cement used in masonry and plaster from the waste biscuit firing of ceramic

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**Abstract.** The purpose of this study is to study the characteristics of cement mixes and to find out the right qualities according to Mortar Cement in terms of flow formation period compressive strength. This work was tested for the properties of cement Mortar at Research and Development Department, Department of Concrete Testing, Royal Irrigation Thailand in ASATM C 91-97C, and ASTM C 807-89 standard. The results of the study indicated that the formula of Mortar Cement A1 flow characteristics 112, the formation time was 45 minutes and the compression strength was on the average of 39.35 MPa. Mortar Cement A2 flow characteristics 112 formation time was 45 minutes, compression strength was on the average of 25.35 MPa. Mortar Cement A3 properties of flow 118, formation time was 60 minutes, Compression strength was on the average of 17.73 MPa. Mortar Cement A4 features of flow 113, formation time was 55 minutes, compression strength was on the average of average 15.33 MPa. Mortar cement A5 features of the flow 114, formation time was 55 minutes compression strength was on the average of average 15.30 MPa. From the experimental result, we found that the best formulation is Mortar Cement A1, which has the highest characteristics in every property. From this study Molar cement, a material in the pozzolanic group, it is suitable for production and development in repairing old buildings or historic site. Mortar Concrete has less expansion but high density of water slow rate of development due to slow reaction with water. However, the compressive strength in the back is the same, the old work with the repair parts do not crack because of the surface tension, the material caused by rapid dehydration.

## 1 Introduction

Mortar or "ready-mixed cement" is a mixture of cement, sand and special additives in the appropriate ratio from the factory. Just rinse the bag and add water to the proportion that you can use it. This cement has a variety of formulas. The multi purpose use such as; plastering, multi-purpose repair, floor leveling, waterproofing and bonding of concrete walls with a worthy adhesion to concrete walls, which was not slipping. The application of this material is both inside and outside wall construction, which reduce cracking in smoother walls for concrete plastering. These materials, such as; plaster surface, surface finish, cast concrete, gypsum board, fiber cement board is widely used in Thailand. Removes surface imperfections, such as; air bubbles, small cracks, cracks, sagging marks, sand marks on the plaster surface of the walls and ceilings, both inside and outside are well known as well. Benefits of using mortar are working faster; reduce the work process, instant water dispenser, and consistency weight all bags. Save labor to mix mortar, conveying materials and eliminate residues. Reduce problems to repair. In the process of producing ceramics, burning bricks, clay pot plant pottery dishes are

also called low-burning products. We find that there are about 2 tons of waste in the process of production per month. Most of them will be ground into the powder and return to the low pottery to reduce the damage of the workpiece. The researchers are interested in developing, processing to add value and create new products. The researcher is interested to bring the waste from the low-pottery pottery to develop mortar. Because the chemical structure consists of aluminum oxide ( $Al_2O_3$ ), ionic oxide ( $Fe_2O_3$ ), silicon dioxide ( $SiO_2$ ) and lime ( $CaCO_3$ ), we will obtain a fine mortar with fine sand when water is added to the optimum ratio. There are many researches on this subject. Burachat Chatveera and Permphon Srinourm (2012;202) studied the characteristics of Portland Cement Type 4 Mix with rice husk ash and limestone powder. The properties of Portland cement, mix with ground ash and limestone powder to find out the physical and the chemical properties that are water requirements. In the study of compressive strength and shrinkage of concrete, the solutions used in this study were sodium sulfate ( $Na_2SO_4$ ) and magnesium sulfate ( $MgSO_4$ ). The concentrations of these two solutions were 5% by weight, in accordance with ASTM C1012 standard, rice husk ash and limestone powder with a particle size of 29, 12 and 128 micron. Rice husk, ash,

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and limestone powder in Portland cement are 0%, 20% and 40% weight of cementitious materials. The ratio of water to cement material is controlled according to the water requirement. The results showed that the compressive strength of mortar was at  $110 \pm 5\%$ . Decrease in percentage of rice husk ash and limestone powder. In Portland cement at the age of 180 days, the compressive strength of all concrete was lower than the control mortar (mixture of rice husk ash and limestone powder). The compressive strength is in the highest value in concrete control. As a result of the resistance to sulfate, the substitution of rice husk, ash, and limestone powder in Portland cement are in a higher percentage of concrete loss and shrinkage. Baboo Rai, Sanjay Kumar, and Kumar, Satish (2014;1) evaluated the compressive strength and shear strength of 1: 3 sand mortar. The natural sand was replaced with 20%, 50% and 100% by weight of rock dust, by partial displacement (15%, 20% 25% and 30%) of low calcium fly ash. The compression time and shear strength were determined within 3, 7, 28 and 50 days. The results showed that the use of fine powdered rock and fly ash was the most effective. Due to its ability to efficiently fill the microorganism and the pozzolanic reaction. G J Prasanna Venkatesh, S, S Vivek and G Dhinakaran (2017; 1) carried out the structure, which was used as a pillar and then plastered increase the adhesion of brick, sand, cement, adhesion. In the study of cement mortar repair, structural restoration and plastering wall technology of Mortar is necessary. Cement was replaced with minerals from 5% to 20% (up to 5%), Metakaolin (MK) from 10% to 30% (up to 10%) and large scale furnace slag (GGBS) from 25% to 75% (25% increases). The ratio between cement and fine sand is 1:2 for all cement, cement and mortar components. Incubation with a different temperature was 128 °C for 4 hours. The results showed that the compressive strength of the conventional drying method and the electric oven was higher than that of the conventional concrete. The cement substitution by SF 15%, MK 20% and GGBS 25% were stronger than those of both types. The purpose of the study was; to study the mixture rate of Portland cement, waste from the low-pottery, lime, fine sand for mortar used in plastering work and to study of mortar properties in accordance with ASATM C 91-97C, ASTM C807-89 standard for example; in terms of flow, time setting, and compressive strength.

## 2 Materials & Method

Portland cement is a mixture of limestone, soil, dirt, gypsum, mined, and mixed with water to be mixed together to burn at 1000 degrees Celsius; it will be grinded black gray to grind. 320 metric tons are collected in silos. Portland cement is used to mix stone, sand and concrete water used to make foundation beams, buildings, and condominiums. Waste from the low pottery or biscuit waste from the low-voltage containers or the brick-burning plant. There will be waste from the combustion process of 2 tons per month; one part will be used to grind the soil to be mixed with new products to reduce the crack. But with chemical elements, there are

aluminosilicates. Ferric Oxide Silicon oxide can be used as a mixture of mortar. When removing the waste material from the low-pressure container, and mixed with lime and Portland cement. Mortar is used in construction and plaster works. Limestone is Lime is derived from the explosion of Limestone Mountains with lime. Take the limestone to mill and find out the sieve size and put on 20 kilograms per bag. Lime is a chemical element is calcium oxide. When mixed with the ground biscuit powder and sand, it turns to be mortar. Sand originated by the erosion of sandstone in the mountains and is carried through the canal, river canals and when deposited into the belly or led into the river, so the sand sucked up and mixed with cement.

## 3 Methodology

Terms of flow testing;

1. Clean the surface of the table, flow clean and dry. Then place the flow test down in the middle.
2. Load the mortar in a flow test to a height of about 25 mm and protruding the ram with 20 times throughout the cut.
3. Load the mortar in another 1 layer of about 25 mm height and mortar as well as the first layer of the mortar to put the second layer of mortar to a higher.
4. After the ram has been completed. Trowel the surface. The steel trowel is almost perpendicular to the surface of the model.
5. Lift up slowly in the vertical direction. It takes time to put the mortar down until it is lifted from the surface of the table, about 1 minute flow.
6. After the lift out of Mortar Rotate the table of flow. This will lift the spool of the flow table up to 13 mm high and let loose 25 loops in 15 seconds while rotating the swivel of the flow table. Keep tables tightly closed. Do not move because it will cause erroneous test flow.
7. Mortar was put on the plate on the top of the table, the flow will be spread like a circle. Vernier caliper was used to measure four times in the center of the mortar, at a distance of 45 angles (or measured along the trailing line on the plate of the flow table) plus the reading value. 4 sessions of Calipers The reading is the percentage of the mortar diameter increased from the original (the diameter of the flow test is 10 cm).
8. For testing using Portland cement. Record flow values between 110 (+ 5, -5) by adjusting the amount of water used to mix. [4]

Cement paste setting time testing;

1. Cement Pest prepared from the preparation. Let's make a round ball quickly. Do the glove too. Then throw it - come 6 times, both hands about 1.5 cm apart.
2. Put the cement paste into the large cone by hand. Press in and then use the hand to scrape the pest to smooth at once. Then put it on the glass. With the glass plate to make the pest to overflow smoothly with the large cone edge, then use the steel girdle to pour the cement pest into the small cone smooth to the edge of the cone. The steel

tilt is oblique and smooth. If any part of the pest cement is cracked or uneven, use a steel girdle repeatedly or gently. Do not press on the surface of this cement pest.

3. The cement paste cube band (This cement paste must be placed on the glass all the time. Move it up with this sheet of glass.) Leave it in a damp room for 30 minutes without being disturbed or inflicted.

4. Bring the cone with the glass plate to the test stand. 1 m of vibration test kit Adjust the needle scale to the surface of the cement pest, then adjust the test specimen to the sink to scale (0), so that the distance between the base of the base and the base of the cone is not less than 9 mm and the next test, the distance of the standard needle is at least 6 mm away from the original image tested.

5. Release the standard needle to sink in the pestle for 30 seconds and read the sink on the scale. The intensity may be bent or damaged. Because cement pest is very weak. The needle may be impacted against the glass placed underneath the cone. Then slowly release the needle into the cement pest. This method is technically only not the correct way (the correct method is to release the needle only).

6. Leave it for 15 minutes and test it again. (In accordance with clauses 4 and 5) with time recording of the penetration of the standard needle. Do this until the sinking period. 25 m. The values are inclusive of the time from the beginning of the mixture to the duration of the 25 mm sink, called the initial formation period.

7. The formation of the end of this form will change with the use of the needle to release the needle on the surface and then appear on the cement surface pest. The time from the start of the mix of this time is the end of the formation phase. Cement paste setting time testing is show in Figure 1.

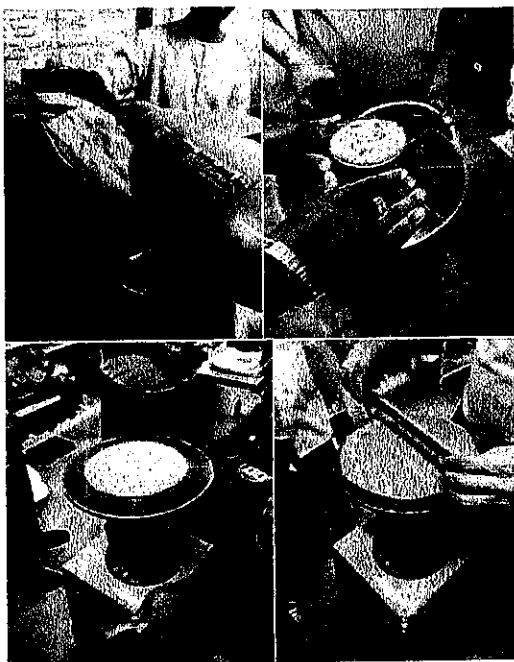


Figure 1. Cement paste setting time testing.

#### 4 The Compressive Strength testing;

1. Cement cube mold in the size of 2x2x2 inch or 50x50x50 mm, the test form must be tightly packed. Up to two pieces can be used and one cast has a maximum of three cubes. The mold is made of solid material, smooth surface, with corner angle. Not more than 0.5 mm and not reacted with mortar. Flow Table and Flow Mold used to test the flow of mortar. Comply with ASTM Designation C-230.

2. Tamper rods must be made of non-absorbent material. It is not worn or frictionless and fragile, such as made of hard wood, then discarded. And do not absorb water by soaking in hot paraffin oil at 200 C for 15 minutes or by hardening with a hardness of  $80 \pm 10$  measured by a Shore A Durometer. The field must have a cross section of 13x25 mm (1/2 x 1 inch) and a length of about 120 to 150 mm and the cross section shall be perpendicular to the long axis of the rod.

3. The mixer is electrically driven. Comply with ASTM designation C-305.

4. Balance reading 0.1 g.

5. Measuring cylinder is large enough to measure water only once. The measurement was done at 20 °C with a tolerance of not more than  $\pm 2$  m. In this test, the measuring range was 500-1000 m.

6. Trowel (flat iron) the rim of the trowel.

7. Vernier Caliper measuring in the range of 8-10 inches.

8. Hydraulic testing machine, the spiral between the front of the upper and lower keys. It must be enough space to remove the equipment needed to test the installation. And the gap for the test cube fit. Pressures must be accurate to  $\pm 1$  percent. The upper and lower keys are hard metal. The top of the keyboard has a rounded base that fits snugly against the center of the upper key. As we walked the test machine, the top was down with the specimen on top of it, although it was firmly attached to the sphere. It can be tilted in all directions according to the surface of the contact surface of the press pad, platen plate hardened using a test sample. The Rockwell hardness must not be less than HRC 60. [5] The Compressive Strength testing is shown in Figure 2.

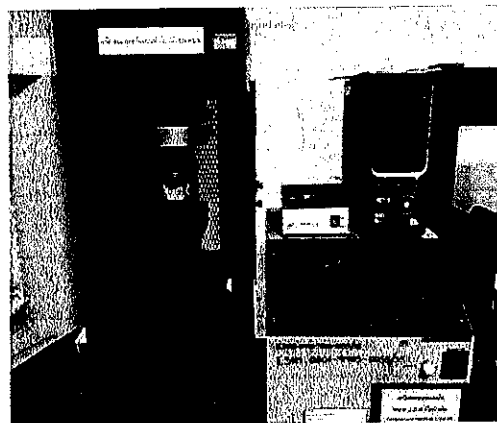


Figure 2. The Compressive Strength testing.

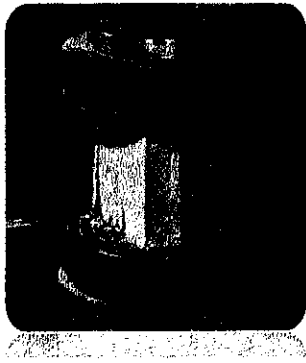


Figure 3. The Compressive Strength testing.

### 5 Experimental Results

From the table show the mortar properties of mortar by studying the ratio of Portland cement, low-calorie, lime, fine sand. Found that formula A1-A5. Mortar has a standard of mortar with a flow rate of 110 (+5, -5). Formation period time was 60 minutes. Compaction capacity 2.5 Mpa. 5.2 m. Formula A1 study The best formula A2-A5 passes the standard, except the A3 does not pass the standard because the flow exceeds the standard.

Table 1. The mortar properties of mortar by studying the ratio of Portland cement, low-calorie, lime, fine sand. Found that formula A1-A5.

Formula	Portland cement %	Waste from the low pottery %	Lime stone %	Sand %	Terms of flow	Cement paste setting time minute	Mean Compressive Strength (Mpa)
A <sub>1</sub>	12.14	15.17	12.69	60	112	45	39.35
A <sub>2</sub>	12.14	12.69	15.17	60	113	45	35.35
A <sub>3</sub>	13.25	13.50	13.25	60	118	60	17.73
A <sub>4</sub>	13.25	13.25	13.50	60	113	55	15.33
A <sub>5</sub>	10.90	18.21	10.90%	60%	114	55	15.50

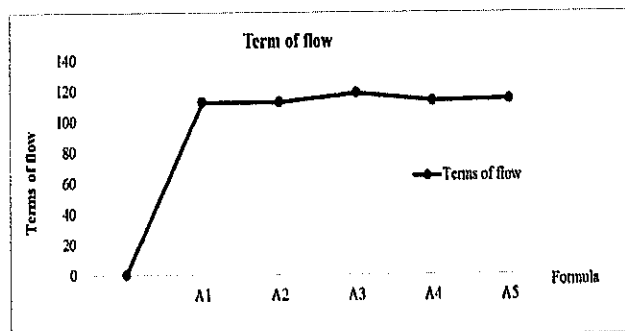


Figure 4. The slurry of Portland cement, low-calorie, lime, and fine sand.

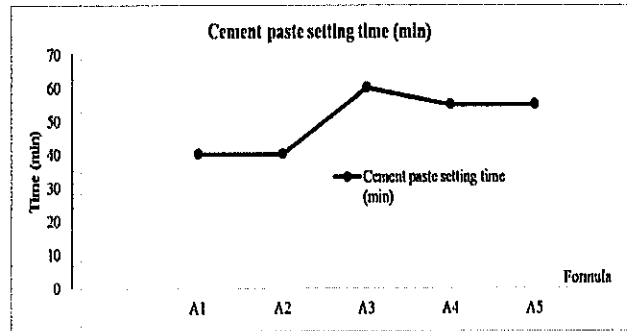


Figure 5. The cement mortar composed of Portland cement, low-caloric, lime, fine sand.

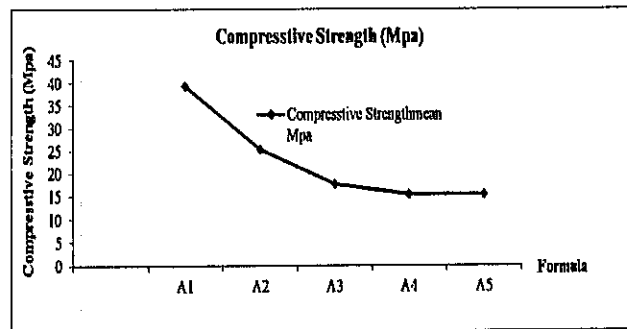


Figure 6. Compressive strength of Portland cement, low-caloric, lime, and fine sand.

### 6 Summary

The properties from the study of mortar mixing Portland cement, low-caloric, lime, fine sand. The best mixing ratio of Portland cement was 12.14%. Waste from the low pottery 15.17% Limestone was 12.69%, and sand was 60%. Properties of mortar mixing Portland cement, low-caloric, lime, fine sand. The highest quality from the experiment was A1 formula in terms of flow 112 and the cement paste setting time was 45 minutes and the mean compressive strength was 39.35Mpa. Cement mixes for material Pozzolan are suitable to be used in the repair and construction of old buildings. Concrete has less expansion high density of water. Slow rate of development due to slow reaction with water. However, the compressive strength in the back is the same, the old work with the repair parts do not crack because of the surface tension, the material caused by rapid dehydration.

### References

1. Chatveera, B. and Srinourn, P. Journal of Research and Development King Mongkut's University of Technology Thonburi. Year 2 April - June (2012)
2. Baboo Rai, Sanjay Kumar, and Kumar Satish. Hindawi Publishing Corporation Advances in Materials Science and Engineering, Volume Article ID 626425, 7 pages (2014)
3. G. J Prasanna Venkatesh, S S Vivek and G Dhinakaran . ICCIEE 2017 IOP Conf. Series:

Short title of the conference

Earth and Environmental Science 80 012002 (2017)

4. SIRISAWAT I, SAENGSOY W, BAINGAM L, KRAMMART P. Durability and testing of Mortar with underground fly ash and limestone cements in sulfate solutions Journal of

Construction and Building Materials, Vol.64 (2014)

5. ZHANG Ming-hua, JIANG Ming-qiang, CHEN Jian-kang. Variation of flexural strength of cement mortar attacked by sulfate ions Journal of Engineering Fracture Mechanics, Vol.75(17) (2008), p. 4948–4957.

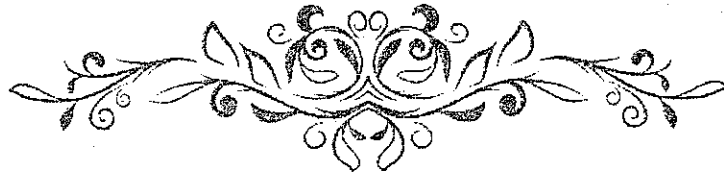
**Authors' background**

Your Name	Title*	Research Field	Personal website
Wiwat Klangvijit	Asst. Prof. Dr.	1993; Experiment on the optimum ratio of wood substrate Of Portland cement material. Ash, chalk, lime and coconut fiber. 1995; Appropriate proportion of ready-mixed plaster Of Portland cement material. Ash, lime, and Scaly stone 1997 ; Comparative study of Ferrodux ferrite between Fe <sub>2</sub> O <sub>3</sub> + BaO and Fe <sub>2</sub> O <sub>3</sub> + BaO + SiO	
Krissadang Sookramoon	Asst. Prof. Dr.	Mechanical Engineering Solar Energy	

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\*Title can be chosen from: master student, Phd candidate, assistant professor, lecture, senior lecture, associate professor, full professor





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*for*

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**Paper title:** Study of the Mix Cement Properties of Mortar  
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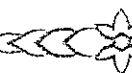
**Presenter's name:** Wiwat Klangvijit (C3004)

**Presenter's affiliation:** Vallaya Alongkorn Rajabhat  
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เวลา..... 12.05 น.



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ที่ ๐๖๗/๒๕๖๑  
เรื่อง ให้ข้าราชการไปราชการ

ด้วยจุฬาลงกรณ์มหาวิทยาลัย ได้กำหนดจัดการประชุมวิชาการนานาชาติ “2018 4<sup>th</sup> International Conference on Chemical Materials and Process” ระหว่างวันที่ ๒๓-๒๕ พฤษภาคม ๒๕๖๑ ณ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพมหานคร

มหาวิทยาลัยจึงให้ ผู้ช่วยศาสตราจารย์ ดร.วิวัฒน์ คลังวิจิตร ไปราชการตามวันและสถานที่  
ดังกล่าว

สั่ง ณ วันที่ ๙ พฤษภาคม ๒๕๖๑

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