

ห้องสมุดงานวิจัย สำนักงานคณะกรรมการการวิจัยแห่งชาติ



E42190

**EFFECTS OF ADDITIVES ON PHYSICAL AND THERMAL INSULATION
PROPERTIES OF CONSTRUCTION BRICK**

NONTEAPONG PEONPHUAK

**DOCTOR OF PHILOSOPHY
IN MATERIALS SCIENCE**

**THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
DECEMBER 2011**

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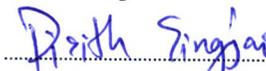
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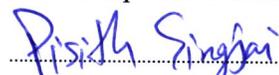
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ABSTRACT

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In this study, the effects of charcoal additive on physical and thermal insulation of fired test briquettes were examined. Charcoal particles of sizes 1-3 (3mm.-0.5mm.) were mixed in the range of percentages ranging from 0, 2.5, 5, 7.5 to 10 by weight in Hang Dong clay. After firing at 900-1100 °C, the results confirmed the better physical and mechanical properties of the fired test briquettes with 2.5-10 % charcoal addition of size 3 which were fired at 950 °C than those of the reference, namely higher apparent porosity due to higher percentage of water absorption 18.27-33.21 % compared to fired clay bricks standardized by Thai Industrial Standards Institute; TISI77-2531 whose water absorption was 25%. The compressive strength of fired test briquettes was 78.59 - 143.45 kg/cm² whereas that of the counterpart was 35 kg/cm².

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According to the results, it could be explained that thermal conductivity decreased with decreasing in density and increased with an increasing in fired briquettes porosity. It was shown that the thermal conductivity was directly proportional to the density of the fired test briquettes. An understanding of conduction process indicated that the determining factor was porosity which was related to density. The thermal conductivity of the fired test briquettes was from 0.262 - 0.216.

ชื่อเรื่องวิทยานิพนธ์	ผลของสารเติมแต่งต่อสมบัติทางกายภาพและสมบัติการเป็นฉนวนความร้อนของอิฐก่อสร้าง	
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บทคัดย่อ

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งานวิจัยนี้ศึกษาผลของการเติมถ่านต่อสมบัติทางกายภาพและสมบัติการเป็นฉนวนความร้อนของอิฐก่อสร้าง โดยการเติมถ่านที่มีขนาดแตกต่างกัน 3 ขนาด คือ ขนาดที่ 1 (2-3 มม.) ขนาดที่ 2 (1-2 มม.) และ ขนาดที่ 3 (เล็กกว่า 0.5 มม.) เมื่อนำมาผสมกับดินเหนียวทางดงในอัตราส่วนร้อยละ 0, 2.5, 5.0, 7.5 ถึง 10 โดยน้ำหนัก หลังจากนั้นนำมาเผาที่อุณหภูมิตั้งแต่ 900-1100 องศาเซลเซียส พบว่าการเติมถ่านขนาดที่ 3 ในอัตราส่วนผสมร้อยละตั้งแต่ 2.5-10 โดยน้ำหนัก เผาที่อุณหภูมิ 950 องศาเซลเซียส มีความพรุนตัวปรากฏสูงในขณะที่ค่าการดูดซึมน้ำอยู่ระหว่าง 18.27-33.21 เปอร์เซ็นต์ ค่าความแข็งแรงอยู่ระหว่าง 78.59-143.45 กิโลกรัมต่อตารางเซนติเมตร และค่าการนำความร้อนคือ 0.262-0.216 วัตต์ต่อเมตร เคลวิน ตามลำดับ ดังนั้นอิฐทดสอบเพื่อการก่อสร้างนี้มีคุณสมบัติทางกายภาพและคุณสมบัติการเป็นฉนวนความร้อนดีกว่าอิฐสามัญก่อสร้างโดยสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม (ม.อ.ก. 77-2531) ที่ให้ค่าการดูดซึมน้ำได้สูงสุด 25 เปอร์เซ็นต์และค่าความแข็งแรงเพียง 35 กิโลกรัมต่อตารางเซนติเมตร

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ABBREVIATIONS AND SYMBOLS

A	Area
ASTM	American Society for Testing Materials
°C	Degree Celsius
cm	Centimeter
COE	Thermal expansion coefficients
d	Diameter
DTA	Differential thermal analysis
dT	Temperature difference
dx	Thickness
g/cm ³	Gram per cubic centimeter
HDC	Hang Dong clay
hr.	Hours
K	Kelvin
k	Thermal conductivity
Kg	Kilogram
Kg/cm ²	Kilogram per square centimeter
L.O.I.	Loss on ignition
mm.	Millimeter
M.W.	Molecular Weight
q	Heat rate
R	Thermal resistance
SEM	Scanning electron microscopy

T	Temperature
TGA	Thermogravimetric analysis
Wt.	Weight
wt%	Weight percent
XRD	X-ray diffraction spectrometry
XRF	X-ray fluorescence spectrometry
μm	Micrometer
%	Percent