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**PREPARATION OF TETRACALCIUM PHOSPHATE FROM
CATTLE BONE**

Miss Sirirat Rattanachan

**A Thesis Submitted in Partial Fulfillment of the Requirments
for the Degree of Master of Science in Technology Ceramics**

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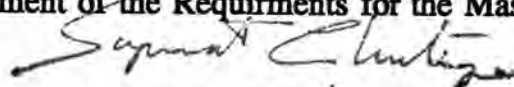
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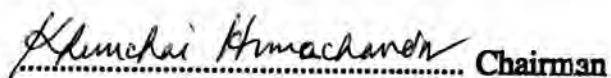
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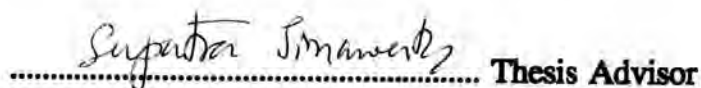


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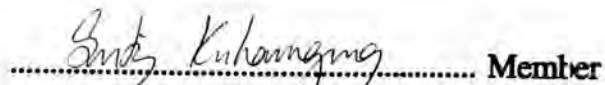
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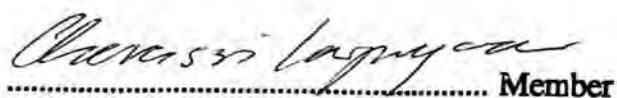
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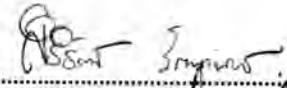
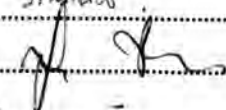

พิมพ์ฉบับฉบับบทคัดย่อวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

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สารเตตระแคลเซียมฟอสเฟต (TTCP) ได้ถูกเตรียมจากกระดูกวัวหรือควาย โดยวิธีซินเตอร์ริง(เผาผนึก) ส่วนผสมของสารไดแคลเซียมฟอสเฟต ไดไฮเดรต (DCPD) กับแคลเซียมคาร์บอเนตที่มีอัตราส่วนจำนวนโมลเท่ากัน และการซินเตอร์ริงส่วนผสมตามสัดส่วนทางเคมีของแกมมาแคลเซียม ไฮโดรฟอสเฟต ($\gamma\text{-Ca}_2\text{P}_2\text{O}_7$) กับแคลเซียมคาร์บอเนตที่อุณหภูมิ 1350 และ 1400°C แล้วทำให้เย็นตัวอย่างรวดเร็วในอากาศ ทั้ง 2 วิธี สามารถให้เฟสเดี่ยวของสารเตตระแคลเซียมฟอสเฟต แต่พบว่าวิธีหลังสามารถให้สารเตตระแคลเซียมฟอสเฟตได้ดีกว่าเนื่องจากบรรยากาศในเตาเผามีความชื้นน้อยกว่า

ซีเมนต์แคลเซียมฟอสเฟตชนิดเซตตัวได้เองถูกเตรียมจาก ส่วนผสมของ DCPD และ TTCP และศึกษาผลของปัจจัยที่มีผลต่อความต้านทานแรงกด และเวลาในการเซตตัว ได้แก่ พื้นที่ผิวของสารเตตระแคลเซียมฟอสเฟต การใช้ไฮดรอกซีอะพาไทต์เป็นตัวเร่ง (seed) อัตราส่วนของผงซีเมนต์ต่อของเหลว (P/L) เวลาในการบ่ม พบว่าค่าความต้านทานต่อแรงกดจะเพิ่มขึ้นด้วยการเพิ่มพื้นที่ผิวจำเพาะของเตตระแคลเซียมฟอสเฟต แต่ลดลงเมื่อความเป็นผลึก (crystallinity) ของตัวเร่งไฮดรอกซีอะพาไทต์เพิ่มขึ้น ชิ้นงานที่ผ่านการอัดเตรียมจากส่วนผสมของเตตระแคลเซียมฟอสเฟตที่อุณหภูมิ 1350°C (มีพื้นที่ผิวจำเพาะ $1.06 \pm 0.01 \text{ m}^2/\text{g}$) กับไดแคลเซียมฟอสเฟต ไดไฮเดรต ด้วยการเติมไฮดรอกซีอะพาไทต์ 35 wt% (มีพื้นที่ผิวจำเพาะ $140.15 \pm 4.20 \text{ m}^2/\text{g}$) อัตราส่วน P/L 2.4 g/ml จะให้ค่าความต้านทานต่อแรงกดสูงสุดหลังจากบ่ม 1 วันคือ $16.2 \pm 3.0 \text{ MPa}$ เวลาในการเซตตัวของซีเมนต์ลดลงด้วยการเพิ่มพื้นที่ผิวจำเพาะและปริมาณของตัวเร่ง

ภาควิชา วัสดุศาสตร์
สาขาวิชา เทคโนโลยีเซรามิก
ปีการศึกษา 2540

ลายมือชื่อนิสิต 
ลายมือชื่ออาจารย์ที่ปรึกษา 
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม 

C826311 : MAJOR CERAMIC TECHNOLOGY

KEY WORD: TETRACALCIUM PHOSPHATE / CALCIUM PHOSPHATE CEMENT / SELF-SETTING CEMENT
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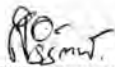
Tetracalcium phosphate (TTCP) was synthesized from cattle bone by sintering the equimolar mixture of dicalcium phosphate dihydrate with calcium carbonate and by sintering the stoichiometric mixture of gamma calcium pyrophosphate with calcium carbonate at 1350-1400°C and following with quenching in air. Both methods could produce single phase TTCP but the second method gave a better reproducibility due to the lesser moisture in the furnace atmosphere.

Self-setting calcium phosphate cements were prepared from an equimolar mixture of DCPD and TTCP, and the effects of the following factors on the compressive strength and setting time of cements were investigated : specific surface area of TTCP, seeding with hydroxyapatite (HA), powder /liquid ratio (P/L) and curing time. It was found that the compressive strength increased with the specific surface area of TTCP but decreased with the increase of the crystallinity of the HA seed. The highest 1 day compressive strength achieved with the pressed specimens (TTCP,1350°C, specific surface area of TTCP = $1.06 \pm 0.01 \text{ m}^2/\text{g}$) with 35wt% HA (70°C, specific surface area $140.15 \pm 4.20 \text{ m}^2/\text{g}$), P/L ratio = 2.4 g/ml, was $16.2 \pm 3.0 \text{ MPa}$. The setting time of the cement decreased with the increase of specific surface area and content of HA seed.

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ลายมือชื่อนิสิต  สิริรัตน์

ลายมือชื่ออาจารย์ที่ปรึกษา 

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