

สมบัติเชิงกลของซีเมนต์กระดุกเสริมแรงด้วยสารเสริมแรงชนิดผง



นาย ชัยพร เสงศรีธวัช

ศูนย์วิทยพัชการ

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**MECHANICAL PROPERTIES OF PARTICULATE  
REINFORCED BONE CEMENT**

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**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT  
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พิมพ์ต้นฉบับบทคัดย่อวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

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สมบัติเชิงกลของซีเมนต์กระดูกพอลิเมธิลเมทาไครเลต ซึ่งเป็นซีเมนต์กระดูกดั้งเดิมสามารถปรับปรุง โดยการแทนที่พอลิเมธิลเมทาไครเลตด้วยพอลิเมอร์ผสมของพอลิเมธิลเมทาไครเลตกับพอลิเอธิลเมทาไครเลต ในอัตราส่วน 80 ต่อ 20 ขณะเดียวกันสมบัติเชิงกลของซีเมนต์กระดูกสหพันธ์พอลิเมอร์สามารถปรับปรุงขึ้นอย่างเด่นชัด เมื่อเสริมแรงด้วย แบเรียมซัลเฟต หรือ ไฮดรอกซีอะปาไทต์ที่ 5 ถึง 40 เปอร์เซ็นต์ โดยน้ำหนักของพอลิเมอร์ นอกจากนี้ยังพบว่าประสิทธิภาพการเสริมแรงของไฮดรอกซีอะปาไทต์จะเพิ่มขึ้นอย่างเด่นชัด เมื่อไฮดรอกซีอะปาไทต์มีองค์ประกอบไฮเลบบนพื้นผิวประมาณ 5 เปอร์เซ็นต์โดยน้ำหนักของไฮดรอกซีอะปาไทต์

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Mechanical properties of conventional acrylic bone cement can be improved by replacement PMMA with 80/20 PMMA-Co-PDMA. Consequently, mechanical properties of the copolymer bone cement were significantly improved by reinforced with BaSO<sub>4</sub> or hydroxyapatite (HAP) at 5-40 % by weight of bone cement powder. Further enhancement in the mechanical properties was observed when the copolymer bone cement was reinforced with HAP having silane on the surface approximately 5 % by weight of HAP.



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ภาควิชา.....  
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## CONTENTS

	PAGE
ABSTRACT (in Thai).....	iv
ABSTRACT (in English).....	v
ACKNOWLEDGMENTS.....	vi
CONTENTS.....	vii
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xiii
ABBREVIATIONS.....	xvi
CHAPTER I INTRODUCTION.....	1
CHAPTER II REVIEW OF THE LITERATURE.....	4
2.1 Mechanical Properties of Cortical Bone.....	11
2.1.1 Elastic Behavior of Cortical Bone.....	11
2.1.2 Fracture Toughness of Cortical Bone.....	13
2.2 Development of New Implant Materials.....	16
2.3 Development of New Bone Cement.....	19
2.3.1 Characteristics of Acrylic Bone Cement.....	21
2.3.1.1 General and Chemical Composition....	21
2.3.1.2 Reaction Mechanism of Bone Cement.....	27
2.3.2 Mechanical Properties of Bone Cement.....	31
2.3.3 Factors Affecting Mechanical Properties of Bone Cement.....	33
2.3.3.1 Effect of Handling and Cementing Technique.....	33

## CONTENTS (continued)

	PAGE
2.3.3.1.1 Effect of Handling.....	33
2.3.3.1.2 Effect of Cementing Technique...	34
2.3.3.2 Effect of Antibiotic and Other Inclusions.....	36
2.3.3.3 Effect of <i>In Vivo</i> Environment.....	37
2.3.3.4 Effect of Radiopacifying Materials....	38
2.3.3.5 Effect of Irradiation.....	39
2.3.3.6 Effect of Temperature.....	39
2.3.3.7 Influency of Porosity.....	40
2.3.3.8 Effect of Strain Rate.....	41
2.3.4 Modified Bone Cement.....	42
2.3.4.1 Fiber Reinforcement.....	43
2.3.4.2 Particulate Reinforcement.....	50
2.3.5 Polymer Replacement Bone Cement.....	54
2.3.6 Compatibility Enhancement with Silane Coupling Agent.....	55
CHAPTER III EXPERIMENTAL.....	59
3.1 Chemicals and Materials.....	59
3.1.1 Bone Cement Powder.....	59
3.1.2 Bone Cement Liquid.....	60
3.1.3 Silane Coupling Agent.....	60
3.1.4 Reinforcement.....	60



## CONTENTS (continued)

	PAGE
3.2 Apparatus.....	62
Mould for Tensile Testing.....	62
3.3 Machines and Instruments.....	63
3.3.1 Particle Size Analyzer.....	63
3.3.2 Scanning Electron Microscopy (SEM).....	63
3.3.3 FT-IR Spectrophotometer.....	64
3.3.4 Universal Testing Machine.....	64
3.4 Sample Preparation and Testing Procedure.....	64
3.4.1 Particle Size Analysis.....	64
3.4.2 Microstructural Analysis.....	64
3.4.3 Silane Surface Treatment on Hydroxyapatite....	65
3.4.4 Silane Content Determination.....	65
3.4.5 Preparation of Tensile Specimens.....	66
3.4.6 Tensile Testing.....	67
CHAPTER IV RESULT AND DISCUSSION.....	69
4.1 Shape of PMMA, PMMA-Co-PEMA, BaSO <sub>4</sub> , HAP investigated by SEM.....	69
4.2 FT-IR Characterization of Silane Coupling Agent on Hydroxyapatite.....	76
4.3 Silane Coupling Agent Content on Hydroxyapatite.....	78
4.4 Mechanical Properties of BaSO <sub>4</sub> Reinforced PMMA Bone Cement.....	78
4.5 Mechanical Properties of BaSO <sub>4</sub> Reinforced PMMA-Co-PEMA Bone Cement.....	81

## CONTENTS (continued)

	PAGE
4.6 Mechanical Properties of Hydroxyapatite Reinforced PMMA-Co-PEMA Bone Cement.....	84
4.7 Mechanical Properties of Silane Treated HAP Reinforced PMMA-Co-PEMA Bone Cement.....	86
4.8 Void Content in the Bone Cement Specimens.....	94
CHAPTER V CONCLUSION.....	101
SUGGESTION.....	102
REFERENCES.....	103
APPENDIXES	
APPENDIX A Mechanical Properties Test by Instron Universal Testing Machine .....	118
APPENDIX B Calculation Works.....	121
APPENDIX C Basic of Instruments.....	123
VITA.....	128

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## TABLES

		PAGE
Table 2.1	Some previous investigations of the fracture mechanics parameters for bone.....	15
Table 2.2	Comparison of mechanical properties of current implant materials with those of cortical bone.....	17
Table 2.3	Current clinical applications of acrylic resin implants.....	21
Table 2.4	Composition of mouldable room temperature curing <sup>(a)</sup> acrylic resin.....	29
Table 2.5	Effect of mechanical properties for radiopacifiers added PMMA cement.....	38
Table 2.6	Mechanical properties of human bone, PMMA, and prosthesis materials.....	45
Table 2.7	Mechanical properties of carbon fiber reinforced PMMA.....	47
Table 2.8	The mechanical properties of typical bioactive materials.....	53
Table 3.1	Characteristic of powders and reinforcements.....	59
Table 3.2	Chemical composition of bone cement.....	67
Table 4.1	Silane coupling agent content in hydroxyapatite.....	78
Table 4.2	Tensile properties of BaSO <sub>4</sub> reinforced PMMA.....	79
Table 4.3	Comparison of tensile properties of PMMA-Co-PEMA and PMMA .....	81

## TABLES (Continued)

	PAGE
Table 4.4 Tensile properties of BaSO <sub>4</sub> reinforced PMMA-Co-PEMA.....	82
Table 4.5 Tensile properties of untreated hydroxyapatite reinforced PMMA-Co-PEMA.....	84
Table 4.6 Tensile properties of PMMA-Co-PEMA bone cement reinforced with hydroxyapatite having 3.72 weight percent silane content .....	87
Table 4.7 Tensile properties of PMMA-Co-PEMA bone cement reinforced with hydroxyapatite having 5.21 weight percent silane content .....	89
Table 4.8 Tensile properties of PMMA-Co-PEMA bone cement reinforced with hydroxyapatite having 7.83 weight percent silane content .....	91
Table 4.9 Void content of bone cement specimens.....	95

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## FIGURES

		PAGE
Figure 1.1	Schematic diagram showing Charnley's total hip replacement .....	7
Figure 1.2	Schematic diagram showing factors effecting characteristic of joint.....	8
Figure 2.1	Chemical structure of organic components in the powder.....	23
Figure 2.2	A characterized tacticities of bone cement powder.....	25
Figure 2.3	The chemical structure of 3 liquid component.....	26
Figure 2.4	Bonding through silanes by interdiffusion : open circles indicate of regions of coupling agent; solid circles indicate of regions of polymer .....	56
Figure 2.5	Monolayer model for bonding in mineral-polymer composites.....	57
Figure 3.1	A size distribution curve of BaSO <sub>4</sub> .....	61
Figure 3.2	A size distribution curve of hydroxapatite .....	61
Figure 3.3	Standard dimensions mould of ASTM D638 type V (microtension) designer for tensile testing.....	62
Figure 3.4	Standard dimensions mould of ISO/DIS 6239/1 designer for tensile testing.....	63
Figure 4.1	SEM photograph of BaSO <sub>4</sub> particles (a) x 1.0 k (b) x 20 k.....	70
Figure 4.2	SEM photograph of hydroxyapatite particles (a) x 1.0 k (b) x 50 k.....	71

## FIGURES (Continued)

	PAGE
Figure 4.3 SEM photograph x 100 of PMMA powder.....	72
Figure 4.4 SEM photograph x 150 of PMMA-Co-PEMA powder.....	73
Figure 4.5 SEM photograph of fracture sample of untreated hydroxyapatite reinforced PMMA-Co-PEMA bone cement (a) x 800 (b) x 1.0 k.....	74
Figure 4.6 SEM photograph of fracture sample of silane treated hydroxyapatite reinforced PMMA-Co-PEMA bone cement (a) x 1.0 k (b) x 3.0 k.....	75
Figure 4.7 FT-IR spectra of hydroxyapatite before (a) and after (b) silane surface treatment.....	77
Figure 4.8 Tensile properties of PMMA dependence with increasing weight percent of BaSO <sub>4</sub> (a) Stress at maximum load (b) Strain to failure (c) Young's modulus.....	80
Figure 4.9 Tensile properties of PMMA-Co-PEMA dependence with increasing weight percent of BaSO <sub>4</sub> (a) Stress at maximum load (b) Strain to failure (c) Young's modulus.....	83
Figure 4.10 Tensile properties of PMMA-Co-PEMA dependence with increasing weight percent of untreated hydroxyapatite (a) Stress at maximum load (b) Strain to failure (c) Young's modulus.....	85

FIGURES (Continued)

	PAGE
<p>Figure 4.11 Tensile properties of PMMA-Co-PEMA dependence with increasing weight percent of hydroxyapatite having 3.72 weight percent silane content (a) Stress at maximum load (b) Strain to failure (c) Young's modulus.....</p>	88
<p>Figure 4.12 Tensile properties of PMMA-Co-PEMA dependence with increasing weight percent of hydroxyapatite having 5.21 weight percent silane content (a) Stress at maximum load (b) Strain to failure (c) Young's modulus.....</p>	90
<p>Figure 4.13 Tensile properties of PMMA-Co-PEMA dependence with increasing weight percent of hydroxyapatite having 7.83 weight percent silane content (a) Stress at maximum load (b) Strain to failure (c) Young's modulus.....</p>	92
<p>Figure 4.14 Comparison between Young's modulus of the PMMA-Co-PEMA increased with increasing weight percent of hydroxyapatite reinforcement.....</p>	93

## ABBREVIATIONS

min	minute
mm	millimeter
msec	millisecond
mJ	millijoule
ppm	part per million
$\mu\text{m}$	micrometer
$\nu$	Poisson's value
%	percent
ASTM	The American Standard Test Methods
BaSO <sub>4</sub>	barium sulphate
n-BMA	normal butyl methacrylate
BPO	benzoyl peroxide
°C	Celsius degree
DHSS	Department of Health and Social Service
DMPT	N,N-dimethyl-p-toluidine
E	Young's modulus
E <sub>c</sub>	Young's modulus of composite
E <sub>f</sub>	Young's modulus of fiber
E <sub>m</sub>	Young's modulus of matrix
FDA	Foods and Drugs Agency
FT-IR	Fourier transform infrared spectroscopy
G	shear modulus
GPa	gigapascal



## ABBREVIATIONS (continued)

GPC	gel permeation chromatography
$G_c$	critical strain energy release rate
HAP	hydroxyapatite
IPN'S	interpenetrating polymer networks
ISO	International Organization for Standardization
$K_c$	critical stress intensity factor
Mg	megagram
MMA	methyl methacrylate monomer
MPa	megapascal
NMR	nuclear magnetic resonance
PEMA	polyethylmethacrylate
PMMA	polymethylmethacrylate
PMMA-Co-PMMA	polymethylmethacrylate-Co- polyethylmethacrylate
SEM	scanning electron microscope
STEM	scanning-transmission electron microscope
TEM	transmission electron microscopy
$V_f$	volume of fiber
$V_m$	volume of matrix