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EFFECTS OF DEFLOCCULANTS, BINDERS AND MOLD TYPES ON OPTICAL
PROPERTY OF ALUMINA CERAMIC PREPARED BY SLIP CASTING

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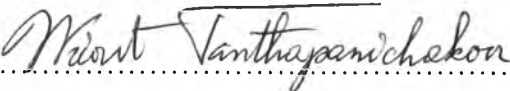
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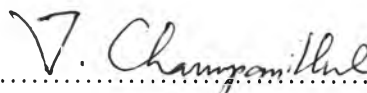
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ศักดิ์ภาส อารีรัชชกุล: ผลกระทบของสารช่วยกระจายตัว สารเชื่อมประสาน และชนิดของแม่พิมพ์ที่มีต่ออะลูมินาเซรามิกเชิงแสงที่เตรียมด้วยวิธีการหล่อแบบ (EFFECTS OF DEFLOCCULANTS, BINDERS AND MOLD TYPES ON OPTICAL PROPERTY OF ALUMINA CERAMIC PREPARED BY SLIP CASTING). อ. ที่ปรึกษา : รศ. ดร. ธวัชชัย ชรินพานิชกุล, อ. ที่ปรึกษาร่วม : ศาสตราจารย์ ดร. ชีเกตากะ วาดะ จำนวนหน้า 97 หน้า. ISBN 974-17-6415-4.

กระบวนการขึ้นรูปเซรามิกอะลูมินาดีบให้มีความหนาแน่นสูงและมีสิ่งเจือปนในปริมาณน้อยนั้น เป็นกระบวนการหนึ่งที่สำคัญที่สุดในการผลิตเซรามิกอะลูมินาดีบ เช่นเดียวกับ กระบวนการใช้อุณหภูมิขนาดซิปไมครอนเป็นวัตถุดิบ และกระบวนการเผาผลึกที่เหมาะสม เซรามิกอะลูมินาดีบที่มีความเป็นรูพรุนต่ำและสิ่งเจือปนน้อยจะนำไปสู่เซรามิกของอะลูมินาที่มีสมบัติเชิงแสงที่ดี ด้วยข้อดีของกระบวนการขึ้นรูปโดยวิธีการหล่อแบบ นอกจากจะได้ชิ้นงานที่มีความเป็นเนื้อเดียวกันแล้ว ยังจะเสียดำใช้จ่ายในการดำเนินการต่ำกว่าเมื่อเทียบกับวิธีอื่นๆ จากการทดลองพบว่า เซรามิกอะลูมินาดีบที่มีความหนาแน่นสัมพัทธ์สูงกว่า 60% สามารถเตรียมได้จาก สารแขวนลอยอะลูมินาที่มีความเข้มข้น 75% ผสมกับสารช่วยกระจายตัว 1.25% โดยน้ำหนัก นอกจากนี้การเติมสารเชื่อมประสานในปริมาณ 0.05% จะช่วยเพิ่มความแข็งแรงของเซรามิกอะลูมินาดีบ โดยไม่ก่อกระทบในทางลบต่อความหนาแน่นของเซรามิกดีบ

แต่อย่างไรก็ตาม ข้อเสียของการขึ้นรูปแบบนี้คือสิ่งปนเปื้อนจากแม่พิมพ์อีปซัม ซึ่งจะสามารถจะกำจัดได้ด้วยการใช้กรดบำบัดก่อนการเผาผลึก จากการทดลองพบว่าการบำบัดด้วยกรดเกลือก่อนเผาผลึก นอกจากจะช่วยกำจัดสิ่งปนเปื้อนจากแม่พิมพ์อีปซัมแล้ว ยังจะทำให้ได้ชิ้นงานเผาผลึกมีความหนาแน่นสูงที่อุณหภูมิต่ำกว่าการเผาผลึกปกติ ยิ่งกว่านั้นชิ้นงานที่ได้จะมีความสม่ำเสมอของขนาดเกรนหลังการเผา อันจะเป็นประโยชน์ต่อคุณสมบัติเชิงแสงของชิ้นงาน

ภาควิชา.....วิศวกรรมเคมี.....ลายมือชื่อนิสิต.....ศักดิ์ภาส อารีรัชชกุล.....
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SAKKAPAS AREERAKSAKUL : THESIS TITLE. (EFFECTS OF DEFLOCCULANTS, BINDERS AND MOLD TYPES ON OPTICAL PROPERTY OF ALUMINA CERAMIC PREPARED BY SLIP CASTING)
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Fabrication of alumina green body with high density and low impurity is one of the most important processes to produce transparent alumina ceramic. Using of submicron particles as raw materials and appropriated sintering processes will give rise to such transparent alumina specimens. Once green body of alumina with low porosity and low impurities could be prepared, good optical properties would be obtained. With advantages of slip casting technique, it provides not only homogeneous specimen but also lower operating cost compared with other technique. From experimental results, alumina green body with density higher than 60% can be prepared from alumina suspension with solid content of 75% and deflocculant concentration of 0.05%. In addition, adding binder of 0.05% could increase physical strength of the prepared green body without negative effect on density of the specimens.

However, disadvantage of this technique is contamination of gypsum mold, which could be eliminated by using acid treatment before sintering. It is found that acid treatment was not only efficiently eliminated gypsum contamination, but also provided specimens with high density at lower sintering temperature. The prepared specimen exhibited the uniformity grain size after sintering, which is beneficial to optical property of the specimens.

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NOMENCLATURES

BU	B specimen with non acid treatment
BT	B specimen with acid treatment
CMC	Carboxy methyl cellulose
EDS	Energy-Dispersive X-ray spectrometer
GU	G specimen with non acid treatment
GT	G specimen with acid treatment
\bar{N}_1	Unit length
HIP	Hot Isostatic Pressing
PCA	Poly-crystal alumina
PMAA	Polymethacrylic acid
PSD	Particle size distribution
SCA	Single-crystal alumina
SEM	Scanning Electron Microscope
$\Delta \bar{l}$	Mean number of interparticle liquid films
$\Delta L/L_0$	Linear shrinkage
$\Delta V/V_0$	Volume shrinkage