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จุฬาลงกรณ์มหาวิทยาลัย

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**SYNTHESIS AND BINDING PROPERTIES  
OF CATION-TEMPLATED ANION RECEPTORS**



**Mr. Supachai Rittikulsittichai**

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

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**Thesis Co-advisor** Assistant Professor Orawon Chailapakul, Ph.D.

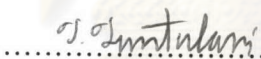
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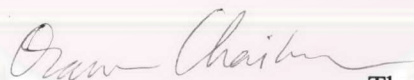
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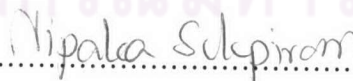
Thesis Committee

  
.....Chairman  
(Professor Sophon Boengsumran, Ph.D.)

  
.....Thesis Advisor  
(Assistant Professor Thawatchai Tuntulani, Ph.D.)

  
.....Thesis Co-advisor  
(Assistant Professor Orawon Chailapakul, Ph.D.)

  
.....Member  
(Associate Professor Nuanphun Chantarasiri, Ph.D.)

  
.....Member  
(Nipaka Sukpirom, Ph.D.)

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ได้ทำการสังเคราะห์พอลิเอธิลีนไกลคอลที่มียูเรียหรือไทโอยูเรียเป็นองค์ประกอบ **5a** **5b** และ **5c** จากนั้น  
 ทำการศึกษาสมบัติการเกิดสารประกอบเชิงซ้อนของลิแกนด์ **5a** กับไอออนชนิดต่างๆ โดยการไทเทรตด้วยเทคนิค  
 โปรตอนนิวเคลียร์แมกเนติกเรโซแนนซ์ (เอ็นเอ็มอาร์) พบว่าลิแกนด์ **5a** เกิดสารประกอบเชิงซ้อนในอัตราส่วน  
 1:1 กับไอออนต่างๆ โดยมีความสามารถในการเกิดสารประกอบเชิงซ้อนกับไอออนเป็นดังนี้ ไดไฮโดรเจน  
 ฟอสเฟต > อะซีเตต > ไนเตรท ~ เบนโซเอท > คลอไรด์ > โบรไมด์ > โซเดียม > ไอโอไดด์ > โพแทสเซียม  
 การศึกษาสมบัติการเกิดสารประกอบเชิงซ้อนของลิแกนด์ **5b** โดยการไทเทรตด้วยเทคนิคยูวีวิสทิเบิลสเปกโตร  
 โฟโตเมทรี พบว่าไม่สามารถหาค่าคงที่ของการเกิดสารประกอบเชิงซ้อนของลิแกนด์ **5b** กับไอออนของโลหะ  
 แอลคาไลได้ อย่างไรก็ตามความสามารถในการเกิดสารประกอบเชิงซ้อนกับแอนไอออนในอัตราส่วน 1:1 เป็น  
 ดังนี้ ไนเตรท > โบรไมด์ ~ คลอไรด์ และในอัตราส่วน 1:2 เป็นดังนี้ เบนโซเอท > ไดไฮโดรเจนฟอสเฟต >  
 ไอโอไดด์ ในการศึกษาผลของอะลอสเตอริกของไอออนของโลหะแอลคาไล และแอนไอออนที่มีผลต่อ  
 ความสามารถในการจับแอนไอออนและโลหะแอลคาไลของลิแกนด์ทั้งสองชนิดพบว่าความสามารถในการจับ  
 กับไอออนของลิแกนด์ขึ้นอยู่กับการจัดโครงสร้างของสารประกอบเชิงซ้อนของลิแกนด์กับไอออนของโลหะ  
 แอลคาไลและแอนไอออน รวมถึงความสามารถในการเกิดไอออนแพร์ระหว่างไอออนของโลหะแอลคาไลและ  
 แอนไอออน การศึกษาสมบัติทางเคมีไฟฟ้าของลิแกนด์ **5b** โดยใช้เทคนิคไซคลิกโวลแทมเมทรี และ สแควร์เวฟ  
 โวลแทมเมทรี สามารถยืนยันได้ถึงผลของการเกิดไอออนแพร์

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ลายมือชื่อนิสิต.....ศุภชัย ฤทธิกุลสิทธิชัย.....  
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ศูนย์วิทยทรัพยากร  
 จุฬาลงกรณ์มหาวิทยาลัย

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KEY WORDS: ACYCLIC CROWN ETHER, ALLOSTERIC BINDING, ION PAIRING, MOLECULAR GATE, NAKED EYE SENSOR

SUPACHAI RITTIKULSITTICHAJ: SYNTHESIS AND BINDING PROPERTIES OF CATION-TEMPLATED ANION RECEPTORS THESIS  
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Acyclic crown ether derivatives containing urea/thiourea moieties, **5a**, **5b** and **5c**, were synthesized. Complexation studies of ligand **5a** with various ions were carried out by <sup>1</sup>H-NMR titrations. Ligand **5a** were able to form 1:1 complexes with various ions in the order of H<sub>2</sub>PO<sub>4</sub><sup>-</sup> > AcO<sup>-</sup> > NO<sub>3</sub><sup>-</sup> ~ BzO<sup>-</sup> > Cl<sup>-</sup> > Br<sup>-</sup> > Na<sup>+</sup> > I<sup>-</sup> > K<sup>+</sup>. Complexation studies of ligand **5b** with alkali metal ions by UV-visible spectrophotometry could not give stability constants. Nevertheless, anion binding abilities of ligand **5b** were calculated and varied as follows: NO<sub>3</sub><sup>-</sup> > Br<sup>-</sup> ~ Cl<sup>-</sup> as 1:1 complexes, and BzO<sup>-</sup> > H<sub>2</sub>PO<sub>4</sub><sup>-</sup> > I<sup>-</sup> as 1:2 complexes. In allosteric studies of alkali metal ions or various anions for both ligands, the anion or alkali metal ion binding abilities depended on structures of complexes between ligands and alkali metal ions and anions as well as the ion-pair formation between alkali metal ions and anions. The electrochemical studies of ligand **5b** by cyclic and square wave voltammetry confirm the occurring of ion-pair formations.

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Student's signature.....*R. Supachai*.....

Advisor's signature.....*T. Tuntulani*.....

Co-advisor's signature.....*Orawon Chailapakul*.....

จุฬาลงกรณ์มหาวิทยาลัย

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## LIST OF ABBREVIATIONS AND SIGNS

Å	Angstrom
°C	Degree Celcius
δ	Chemical shift
CV	Cyclic voltammetry
SWV	Square wave voltammetry
equiv.	Equivalent
g	Gram
<sup>1</sup> H-NMR	Proton Nuclear Magnetic Resonance
Hz	Hertz
<i>J</i>	Coupling constant
K	Kelvin
K <sub>a</sub>	Association constant
M	Molar
mL	Milliliter
mmol	Millimole
mp	Melting point
ppm	Part per million
RT	Room temperature
s, d, t, m	Splitting patterns of <sup>1</sup> H-NMR (singlet, doublet, triplet and multiplet)

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ศูนย์วิจัยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย