

**PREPARATION AND CHARACTERIZATION OF INCLUSION COMPLEXES OF  
-CYCLODEXTRIN WITH 1-BUTYL-3-METHYLIMIDAZOLIUM  
TETRAFLUOROBORATE ([BMIM][BF<sub>4</sub>]) IONIC LIQUID**

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**RESEARCH REPORT SUBMITTED IN FULFILMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF SCIENCE (ANALYTICAL CHEMISTRY AND  
INSTRUMENTAL ANALYSIS)**

**DEPARTMENT OF CHEMISTRY  
FACULTY OF SCIENCE  
UNIVERSITY MALAYA  
KUALA LUMPUR  
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**ABSTRACT**

The interaction between  $\beta$ -cyclodextrin and ionic liquid 1-butyl-3-methylimidazolium tetrafluoroborate ([Bmim][BF<sub>4</sub>]) had been studied. The inclusion complexation interaction was confirmed by FT-IR spectra. The inclusion complex was also characterized by <sup>1</sup>H NMR, TGA and DSC. The results showed that the host-guest system presented a channel type structure and each glucose unit of  $\beta$ -cyclodextrin was in similar environment. The decomposition temperature of inclusion complex was lower than that of [bmim][BF<sub>4</sub>] and  $\beta$ -cyclodextrin individually. The ratio of 1:1 inclusion complex was determined in this study.

**PENYEDIAAN DAN PENCIRIAN KOMPLEKS-KOMPLEK KEMASUKAN  
-CYCLODEXTRIN DENGAN CECAIR IONIK, TETRAFLUOROBORAT 1-  
BUTYL-3-METHYLIMIDAZOLIUM ([BMIM][BF<sub>4</sub>])**

**ABSTRAK**

Sifat dan interaksi di antara  $\alpha$ -cyclodextrin dengan cecair ionik, tetrafluoroborat 1-butyl-3-methylimidazolium ([Bmim][BF<sub>4</sub>]) telah dikaji dalam kajian ini. Interaksi kompleks-komplek kemasukan ini telah dikenal pasti melalui teknik spektroskopi FTIR. Ciri-ciri kompleks-komplek kemasukan ini juga dikaji dengan <sup>1</sup>H NMR, TGA and DSC. Keputusan kajian ini menunjukkan sistem “*host-guest*” yang terhasil daripada interaksi ini mempamerkan struktur terowong (*channel-type*) dan setiap unit glukos yang terdapat pada molekul  $\alpha$ -cyclodextrin berada dalam persekitaran yang sama. Suhu penguraian kompleks kemasukan ini juga adalah lebih rendah daripada molekul asal bagi [bmim][BF<sub>4</sub>] dan  $\alpha$ -cyclodextrin. Ratio 1:1 kompleks kemasukan juga diperoleh melalui kajian ini.

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4) Title of Project/Research Report/Dissertation/Thesis (“this Work”) :

*Preparation and characterization of Inclusion Complexes of  $\beta$ -Cyclodextrin with 1-butyl-3-methylimidazolium tetrafluoroborate ([Bmim][BF<sub>4</sub>]) Ionic Liquid*

- 5) Field of study : Supramolecular and Analytical Chemistry

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## CONTENT

	<b>PAGE</b>
<b>TITLE PAGE</b>	i
<b>ABSTRACT</b>	ii
<b>ABSTRAK</b>	iii
<b>DECLARATION</b>	iv
<b>ACKNOWLEDGEMENTS</b>	v
<b>LIST OF CONTENTS</b>	vi
<b>LIST OF FIGURES</b>	viii
<b>LIST OF TABLES</b>	ix
<b>LIST OF ABBREVIATIONS</b>	x
<b>LIST OF APPENDIX</b>	xi
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background of study	1
1.2 Research Objective	4
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Ionic liquid, 1-butyl-3-methylimidazolium tetrafluoroborate ([bmim][BF <sub>4</sub> ]).	5
2.2 Cyclodextrins	9
2.3 Inclusion complex	12
2.4 Inclusion complex between cyclodextrins and ionic liquids.	14
2.5 Inclusion complex between of $\beta$ -cyclodextrins with various compounds	16
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 Equipments and chemicals	18
3.2 Instrumentation	18
3.3 Preparation of $\beta$ -CD-[bmim][BF <sub>4</sub> ] inclusion complex by Kneading method.	18

<b>CHAPTER 4</b>	<b>RESULT AND DISCUSSION</b>	
	4.1 Characterization of inclusion complex	
	4.1.1 Fourier Transfer-Infra Red (FTIR) Analysis	19
	4.1.2 <sup>1</sup> H NMR Spectroscopy	22
	4.1.3 Differential Scanning Calorimetry (DSC)	25
	4.1.4 Thermogravimetric Analysis (TGA)	27
	4.1.5 Proposed mechanism of Inclusion Complex	29
<b>CHAPTER 5</b>	<b>CONCLUSION</b>	
	5.1 Conclusion	30
<b>REFERENCES</b>		31
<b>APPENDIX</b>		36

## LIST OF FIGURES

FIGURES	PAGE
2.1 Chemical structure of [bmim][BF <sub>4</sub> ]	5
2.2 Chemical structures of cyclodextrins	9
2.3 a) Central cavity of $\alpha$ -CD, b) Doughnut or wreath-truncated cone shape of $\alpha$ -CD molecule	11
2.4 Dimensions and hydrophilic/hydrophobic regions of the CD molecules	11
2.5 Cyclodextrin with empty cylinders rings structure (Connors, 1997)	12
2.6 Schematic representation of host-guest inclusion complex formation	13
4.1 FT-IR spectra of a) $\alpha$ -CD, b) [bmim][BF <sub>4</sub> ] and c) $\alpha$ -CD-[bmim][BF <sub>4</sub> ] respectively.	20
4.2 NMR spectrum of a) $\alpha$ -CD, b) [bmim][BF <sub>4</sub> ] and c) $\alpha$ -CD-[bmim][BF <sub>4</sub> ] inclusion complex.	23
4.3 DSC curves of a) $\alpha$ -CD, b) [bmim][BF <sub>4</sub> ] and c) $\alpha$ -CD-[bmim][BF <sub>4</sub> ] inclusion complex.	26
4.4 TGA the weight loss curve of a) $\alpha$ -CD, b) [bmim][BF <sub>4</sub> ] and c) $\alpha$ -CD-[bmim][BF <sub>4</sub> ]	28
4.5 Inclusion mechanism of $\alpha$ -CD reacts with [bmim][BF <sub>4</sub> ]	29



## LIST OF TABLES

<b>TABLES</b>	<b>PAGE</b>
2.1 Physical and chemical properties of [bmim][BF <sub>4</sub> ]	6
2.2 Properties of Ionic liquid and their potential and current applications	8
2.3 Chemical and physical properties of $\alpha$ -CD, $\beta$ -CD and $\gamma$ -CD	10
2.4 Previous studies on inclusion clusion complexes and their finding	16
4.1 Wavenumber of FT-IR bands of $\alpha$ -CD and $\alpha$ -CD-[bmim][BF <sub>4</sub> ]	19
4.2 Wavenumber of FT-IR bands of [bmim][BF <sub>4</sub> ] and $\alpha$ -CD-[bmim][BF <sub>4</sub> ]	21
4.3 Chemical shifts ( $\delta$ ) of $\alpha$ -CD, [bmim][BF <sub>4</sub> ] and $\alpha$ -CD-[bmim][BF <sub>4</sub> ]	22

## LIST OF ABBREVIATIONS

CD	Cyclodextrin
CDs	Cyclodextrins
IL	Ionic Liquid
ILs	Ionic Liquids
IC	Inclusion Complexes
°C	Temperature
<sup>1</sup> H NMR	Proton-Nuclear Magnetic Resonance
NMR	Nuclear Magnetic Resonance
DSC	Differential Scanning Calorimetry
FTIR	Fourier Transform Infra Red
TGA	Thermogravimetric Analysis
UV Vis	Ultra Violet-Visible Spectroscopy
XRD	X-Ray Diffraction

## LIST OF APPENDIX

APPENDIX	PAGE
A Fourier Transform Infrared Spectroscopy (FTIR)	36
B $^1\text{H}$ NMR Spectroscopy	38
C Differential Scanning Calorimetry (DSC)	40
D Thermogravimetric Analysis (TGA)	42
E Equipment & Chemical	44