

**HIGH PERFORMANCE HYBRID COMPOSITE CONDUCTIVE FILM:
DEVELOPMENT TOWARDS SMART MATERIALS FOR GAS SENSOR
APPLICATIONS**



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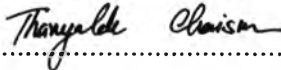
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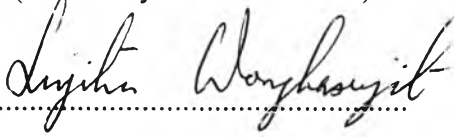
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Applications
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Program: Polymer Science
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Assoc. Prof. Sujitra Wongkasemjit


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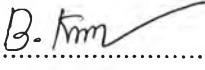

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ABSTRACT

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Polymer composite thin film used for gas sensor applications with a new type of conductive filler called “carbon aerogel” in a polydimethylsiloxane (PDMS) matrix was fabricated and characterized. The resistivity changes of the composite films when exposed to different analytes, viz. tetrahydrofuran, acetone and methanol, were investigated. It is found that different types of polybenzoxazines, used as organic precursors for carbon aerogel preparation have no significant effect on the response of the sensor to the analytes. Compared with commercially available graphite/PDMS composites, the carbon aerogel/PDMS composites show better gas responsivity. By mixing only 8 wt% of our carbon aerogel, the percolation threshold is obtained while as much as 30 wt% of graphite, normally used as a conductive filler, is required to attain the percolation threshold.

บทคัดย่อ

ชลรวี แสงชูรณกิจ : การพัฒนาแผ่นฟิล์มคอมโพสิตนำไฟฟ้าเพื่อใช้สำหรับแก๊สเซนเซอร์ (High Performance Hybrid Composite Conductive Film: Development towards Smart Materials for Gas Sensor Applications) อ.ที่ปรึกษา: ดร.ธัญญลักษณ์ ฉายสุวรรณ และ รองศาสตราจารย์ ดร.สุจิตรา วงศ์เกษมจิตต์ 41 หน้า

แผ่นฟิล์มคอมโพสิตนำไฟฟ้าซึ่งผสมระหว่างพอลิไคเมททิลไซลออกเซนกับคาร์บอนแอโรเจลสังเคราะห์ที่ผลิตมาจากสารตั้งต้นเบนซอกซาซีนเรซินถูกพัฒนาขึ้นสำหรับใช้ในเซนเซอร์ที่วัดสารเคมีระเหย โดยตรวจสอบจากค่าความต้านทานไฟฟ้าของเซนเซอร์ที่เปลี่ยนไปเมื่อได้รับไอสารเคมี สารเคมีที่ใช้ในการศึกษาประกอบด้วย เดตระไฮโดรฟูแรน อะซีโตน และ เมทานอล จากการศึกษาพบว่า แผ่นฟิล์มคอมโพสิตคาร์บอนแอโรเจลสังเคราะห์ที่ผลิตจากสารตั้งต้นต่างชนิดกัน ไม่มีผลกระทบต่อความสามารถในการตอบสนองต่อไอระเหยของสารเคมี แต่ให้ผลการตอบสนองต่อไอระเหยของสารเคมี ได้ดีกว่าแผ่นฟิล์มคอมโพสิตระหว่างพอลิไคเมททิลไซลออกเซนกับแกรไฟต์ ค่าความต้านทานไฟฟ้าสำหรับแผ่นฟิล์มคอมโพสิตที่มี 8% คาร์บอนแอโรเจลสังเคราะห์ในพอลิไคเมททิลไซลออกเซน คือ 7.25×10^7 โอห์มต่อเซนติเมตร และ ค่าความต้านทานไฟฟ้าสำหรับแผ่นฟิล์มคอมโพสิตที่มี 30% แกรไฟต์ในพอลิไคเมททิลไซลออกเซน คือ 6.45×10^7 โอห์มต่อเซนติเมตร

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TABLE OF CONTENTS

| | PAGE |
|---------------------------------------------------------------------------------|-------------|
| Title Page | i |
| Abstract (in English) | iii |
| Abstract (in Thai) | iv |
| Acknowledgements | v |
| Table of Contents | vi |
| List of Tables | viii |
| List of Figures | ix |
| Abbreviations | x |
| | |
| CHAPTER | |
| I INTRODUCTION | 1 |
| | |
| II LITERATURE REVIEW | 2 |
| 2.1 Polybenzoxazine | 2 |
| 2.2 Carbon Aerogels | 6 |
| 2.3 Porous Materials | 9 |
| 2.4 Gas Sensors | 11 |
| | |
| III EXPERIMENTAL | 14 |
| 3.1 Materials | 14 |
| 3.2 Measurements | 14 |
| 3.3 Methodology | 15 |
| 3.3.1 Preparation of Carbon Aerogel derived from Benzoxazine Precursor | 15 |
| 3.3.2 Synthesis of Carbon Aerogel from Polybenzoxazine Prepared from Monomer | 15 |

| CHAPTER | PAGE |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| III EXPERIMENTAL | |
| 3.3.3 Characteristics of Polybenzoxazine and Carbon Aerogel Derived from Polybenzoxazine | 16 |
| 3.3.4 Preparation of Polydimethylsiloxane Composite Conductive Films | 16 |
| 3.3.5 Electrical Response Measurements of Polydimethylsiloxane Composite Conductive Films | 16 |
| IV HIGH PERFORMANCE HYBRID COMPOSITE CONDUCTIVE FILM: DEVELOPMENT TOWARDS SMART MATERIALS FOR GAS SENSOR APPLICATIONS | 18 |
| 4.1 Abstract | 18 |
| 4.2 Introduction | 19 |
| 4.3 Experimental | 19 |
| 4.4 Results and Discussion | 23 |
| 4.5 Conclusions | 33 |
| 4.6 Acknowledgements | 33 |
| 4.7 References | 34 |
| V CONCLUSIONS AND RECOMMENDATIONS | 37 |
| REFERENCES | 38 |
| CURRICULUM VITAE | 41 |

LIST OF TABLES

| TABLE | | PAGE |
|-------------------|-----------------------------------------------------------------------------------------|-------------|
| CHAPTER II | | |
| 2.1 | Comparative properties of various high performance polymers | 3 |
| 2.2 | Structure-property relationship of polybenzoxazines | 4 |
| 2.3 | Definitions about porous solids | 10 |
| CHAPTER IV | | |
| 4.1 | Thermal properties of polybenzoxazines | 27 |
| 4.2 | The physical characteristics of carbon aerogels and graphite used as conductive fillers | 30 |
| 4.3 | The solubility parameter of various solvents | 32 |

LIST OF FIGURES

| FIGURE | | PAGE |
|-------------------|----------------------------------------------------------------------------------------------|-------------|
| CHAPTER II | | |
| 2.1 | Chemical structure of Bisphenol-A and methylamine based benzoxazine monomer | 5 |
| 2.2 | The overall process for the formation of the carbon aerogel | 6 |
| 2.3 | Transmission Electronic Microscopic (TEM) of the carbon aerogel | 7 |
| CHAPTER IV | | |
| 4.1 | Preparation of polybenzoxazine precursor | 21 |
| 4.2 | FTIR spectra of polybenzoxazine precursor | 24 |
| 4.3 | ¹ H-NMR spectrum of partially cured polybenzoxazine | 25 |
| 4.4 | DSC thermograms of partially-cured benzoxazine precursor and fully-cured polybenzoxazine | 26 |
| 4.5 | TGA thermogram during the pyrolysis of the polybenzoxazine | 27 |
| 4.6 | SEM micrographs of organic aerogel and carbon aerogel | 28 |
| 4.7 | TEM photograph of the carbon aerogel | 28 |
| 4.8 | The electrical percolation thresholds of different types of conductive filler in PDMS matrix | 29 |
| 4.9 | The dynamic adsorption curves | 31 |
| 4.10 | The percentage change of resistivity of each sensor to THF, acetone and methanol | 33 |

ABBREVIATIONS

| | |
|---------|--------------------------------------------------------------|
| Ba-teta | Benzoxazine is based on bisphenol A and triethylenetetramine |
| Ba-a | Benzoxazine is based on bisphenol A and aniline |
| PDMS | Polydimethylsiloxane |