

**POLYDIPHENYLAMINE/ZEOLITE Y COMPOSITES AND  
ELECTRICAL CONDUCTIVITY RESPONSE TOWARD  
HALOGENATED HYDROCARBONS**

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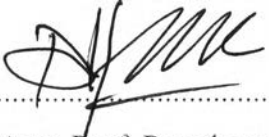
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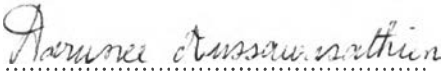
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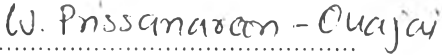
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## ABSTRACT

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Discriminant analysis

Composites of polydiphenylamine (D-PDPA) and zeolite Y with  $H^+$  as the cation (YH) was fabricated to be used as a sensing material towards halogenated solvents which are toxic towards human and environment and have been widely used as solvents in various industries. The electrical conductivity and sensitivity of the composites towards the solvents was higher than the pristine PDPA by about 1 order of magnitude. The composite possessed maximum electrical conductivity sensitivity values towards dichloromethane, but they did not respond to hexane. Generally, the sensitivity of the composites increased with increasing zeolite content and vapor concentration. In order to enhance the sensing properties of the composites, PDPA was synthesized in nanoscale (nPDPA) by emulsion polymerization and YH was modified by the dealumination process (DYH) to increase the silicon and alumina ratios. The composite of nPDPA and DYH showed a higher sensitivity when exposed to the solvents than the pristine nPDPA and zeolite. The interactions between the composite and hydrocarbon vapors were investigated by FT-IR spectroscopy and UV-Vis spectrophotometry. Statistic discriminant analysis confirmed that the response patterns of the composite toward each chemical solvent could be distinguished among non polar and low polar solvents, but not high polar solvents.

## บทคัดย่อ

ชราภรณ์ เพิ่มพูล : ศึกษาความสามารถในการนำไฟฟ้าและการตอบสนองต่อฮาโลจีเนตไฮโดรคาร์บอนของสารผสมระหว่างพอลิไดฟีนิลเอมีนกับซีโอไลต์วาย (Polydiphenylamine/Zeolite Y composites and Electrical Conductivity Response toward Halogenated Hydrocarbons)  
 อ. ที่ปรึกษา : ศ.ดร. อนุวัฒน์ ศิริวัฒน์ และ ดร. ครุณี อัสวเสถียร 173 หน้า

วัสดุผสมระหว่างพอลิไดฟีนิลเอมีน (D-PDPA) และซีโอไลต์วายที่มีไฮโดรเจนเป็นประจุบวก (YH) ถูกสังเคราะห์ขึ้นเพื่อใช้เป็นวัสดุตรวจจับไอระเหยของสารประกอบไฮโดรคาร์บอนระเหยง่ายที่มีคลอรีนในโมเลกุล ซึ่งมักใช้เป็นตัวทำลายในโรงงานอุตสาหกรรม ไอระเหยของสารเหล่านี้มีความเป็นพิษซึ่งส่งผลกระทบต่อสุขภาพและสิ่งแวดล้อม จากการทดลองพบว่า วัสดุผสมสามารถตอบสนองต่อไดคลอโรมีเทนได้ดีที่สุด แต่ไม่ตอบสนองต่อเฮกเซน และค่าการตอบสนองทางไฟฟ้าของวัสดุผสมมีค่ามากกว่าค่าของ D-PDPA ถึง 10 เท่า ยิ่งไปกว่านั้นยังสามารถเพิ่มค่าการตอบสนองทางไฟฟ้าต่อสารประกอบไฮโดรคาร์บอนเหล่านี้ได้โดยการสังเคราะห์ D-PDPA ขนาดอนุภาคนาโนและเพิ่มอัตราส่วนระหว่างซิลิกอนและอะลูมินาผ่านกระบวนการกำจัดอะลูมินาออก (dealumination process) (DYH) ซึ่งพบว่า วัสดุผสมระหว่าง D-PDPA ขนาดอนุภาคนาโน (nPDPA) และ DYH ให้ค่าการตอบสนองทางไฟฟ้าต่อสารประกอบไฮโดรคาร์บอนสูงกว่า nPDPA และ DYH ปฏิกริยาระหว่างวัสดุผสมและสารประกอบไฮโดรคาร์บอนถูกวิเคราะห์โดยเทคนิค FT-IR สเปกโตรสโคปี และ UV-VIS สเปกโตรโฟโตเมทรี การวิเคราะห์การจำแนกกลุ่มทางสถิติยืนยันว่า วัสดุผสมสามารถตอบสนองต่อไอระเหยของสารประกอบไฮโดรคาร์บอนในหมู่ที่ไม่ซ้และมีซ้ต่ำได้ดีกว่าสารประกอบไฮโดรคาร์บอนในหมู่ที่มีซ้สูง

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