

**EFFECTS OF SOLVENT ON THE CATALYTIC ISOMERIZATION OF 1,5-DIMETHYLNAPHTHALENE AND THE ADSORPTION OF 2,6-DIMETHYLNAPHTHALENE**

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**Thesis Advisors:** Assoc. Prof. Pramoch Rangsunvigit  
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**ABSTRACT**

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2,6-dimethylnaphthalene (DMN) is a precursor to a polyester with enhanced properties, e.g. polyethylene naphthalate (PEN). Limitations of PEN production are the maximum yield and separation of 2,6-DMN. Recently, it was revealed that using toluene as a media can lower the isomerization temperature and provide high purity 2,6-DMN from the adsorptive separation. In this work, the effects of seven solvents on the DMN isomerization and adsorption were investigated; i.e. benzene, toluene, ethylbenzene, m-, o-, p-xylene and p-diethylbenzene. The isomerization experiment using an H-beta catalyst was conducted in a batch reactor. The result indicates that only benzene and toluene facilitate the desired reaction without any side reactions, while the other solvents do not. The adsorptive separation study by using the pulse test technique over NaX and NaY reveals that in order to achieve good separation the adsorptivity of the desorbent has to be balanced with that of DMNs. The acid-base interaction plays an important role by controlling both the DMNs and desorbent adsorptivity. In addition, the Na cations are the major sites creating 1,5-DMN preferential adsorption.

## บทคัดย่อ

อัจฉนา ชอบสะอาด : ผลของตัวทำละลายต่อปฏิกิริยาการเปลี่ยนไอโซเมอร์ของ 1,5-ไดเมทิลเนฟทาลีนและการดูดซับของ 2,6-ไดเมทิลเนฟทาลีน (Effects of Solvent on the Catalytic Isomerization of 1,5-Dimethylnaphthalene and the Adsorption of 2,6-Dimethylnaphthalene) อ. ที่ปรึกษา : รศ. ดร. ปราโมช รั้งสรรพวิจิตร และ ดร. สันติ กุลประทีป  
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2,6-ไดเมทิลเนฟทาลีน (2,6-ดีเอ็มเอ็น) เป็นสารตั้งต้นในการผลิตโพลีเอทิลีนเนฟทาลีน (พีอีเอ็น) ซึ่งเป็นพลาสติกวิศวกรรมที่มีคุณสมบัติดีมาก อย่างไรก็ตามในปัจจุบันการใช้งานของพลาสติกดังกล่าวยังถูกจำกัดจากปัญหาในกระบวนการผลิต 2,6-ดีเอ็มเอ็น ปริมาณสูงสุดของ 2,6-ดีเอ็มเอ็นถูกจำกัดด้วยข้อจำกัดทางอุณหพลศาสตร์ของปฏิกิริยาการเปลี่ยนไอโซเมอร์จาก 1,5-ไปสู่ 2,6-ดีเอ็มเอ็น ดังนั้นจึงจำเป็นต้องมีการแยก 2,6-ดีเอ็มเอ็นซึ่งเป็นกระบวนการที่ทำได้ยากจากปัญหาทั้งสองด้านทำให้กระบวนการผลิต 2,6-ดีเอ็มเอ็นต้องใช้พลังงานและต้นทุนสูง ได้มีรายงานว่าการใช้โทลูอินเป็นตัวทำละลาย 1,5-ดีเอ็มเอ็นจะช่วยลดอุณหภูมิที่ต้องใช้ในปฏิกิริยาการเปลี่ยนไอโซเมอร์จาก 1,5- ไปสู่ 2,6-ดีเอ็มเอ็น นอกจากนี้ยังสามารถแยก 2,6-ดีเอ็มเอ็นโดยวิธีดูดซับได้ในระบบรีเจ็คทีฟ ดังนั้นในงานวิจัยนี้จึงมีจุดประสงค์เพื่อศึกษาผลของตัวทำละลายต่อปฏิกิริยาการเปลี่ยนไอโซเมอร์ของ 1,5-ดีเอ็มเอ็นและต่อการดูดซับของ 2,6-ดีเอ็มเอ็น โดยตัวทำละลายที่เลือกใช้ ได้แก่ เบนซีน, โทลูอิน, เอทิลเบนซีน, เอ็ม-, โอ- และ พี-ไซลีน และ พี-ไดเอทิลเบนซีน จากการศึกษาปฏิกิริยาการเปลี่ยนไอโซเมอร์โดยใช้สารเร่งปฏิกิริยาเอช-เบต้าและเครื่องปฏิกรณ์แบบกะ พบว่าการเปลี่ยนไอโซเมอร์จาก 1,5- ไปสู่ 2,6-ดีเอ็มเอ็นโดยไม่เกิดปฏิกิริยาข้างเคียงอื่นในตัวทำละลายเบนซีนและโทลูอิน จากนั้นเป็นการศึกษาการดูดซับของ 2,6-ดีเอ็มเอ็นบนตัวดูดซับชนิดโซเดียมเอ็กซ์และโซเดียมวายโดยใช้การทดสอบแบบพัลส์ พบว่าความสามารถในการดูดซับของตัวทำละลายที่แตกต่างกันบนตัวดูดซับมีบทบาทสำคัญต่อความบริสุทธิ์ของ 2,6-ดีเอ็มเอ็น โดยปฏิสัมพันธ์ทางกรด-เบสเป็นปัจจัยสำคัญที่ควบคุมความสามารถในการดูดซับของทั้งตัวทำละลายและดีเอ็มเอ็น นอกจากนี้ยังพบว่า การดูดซับแน่นของ 1,5-ดีเอ็มเอ็นเกิดขึ้นที่ตำแหน่งไอออนบวกของโซเดียมภายในตัวดูดซับ

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