

**SYNTHESIS AND CHARACTERIZATION OF ALUMATRANE
COMPLEXES DIRECTLY FROM $\text{Al}(\text{OH})_3$ AND
TRISOPROPANOLAMINE**

Ms. Verawan Nerapusri

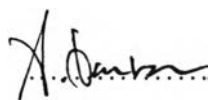
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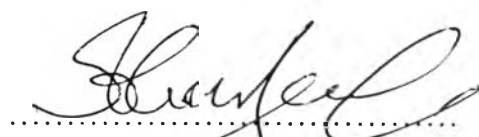
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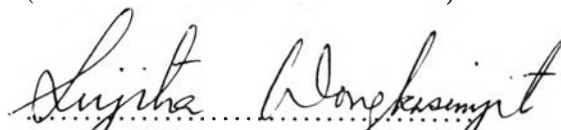
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ABSTRACT

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KEY WORDS : Alumatrane complex / Aluminum hydroxide / The oxide
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The cost of preparing alumatrane complexes is generally high because a multistep process is used and the starting materials are expensive. Recently, a new one step method was developed for synthesizing alumatrane directly from aluminum hydroxide [$\text{Al}(\text{OH})_3$] and triisopropanolamine (TIS) both of which are inexpensive materials and readily available. Triethylenetetramine (TETA), a stronger base than TIS, was found to accelerate the dissolution rate of $\text{Al}(\text{OH})_3$. The product was characterized using TGA, FTIR, and $^1\text{H-NMR}$. Viscometric properties of the product in dilute solution were investigated by viscosity measurement in terms of TIS concentration, reaction time, reaction temperature, and catalyst, TETA, concentration. It was found that the intrinsic viscosity and the overlap concentration were affected by the reaction conditions. The more organic content gave the higher viscosity. The hydrodynamic radius of the synthesized products was also investigated by dynamic light scattering as a function of catalyst concentration. The product with a higher catalyst concentration gave a larger hydrodynamic radius R_{H} ; and therefore a higher molecular weight polymer was produced.

บทคัดย่อ

วิระวรรณ เนระพูสี : การสังเคราะห์และศึกษาสมบัติของสารประกอบอลูมาทรนโดยตรงจากอลูมินัมไฮดรอกไซด์ และไตรไอโซโพรพานอลามีน (Synthesis and Characterization of Alumatrane Complexes Directly from $\text{Al}(\text{OH})_3$ and Triisopropanolamine), อาจารย์ที่ปรึกษา : ศ. ดร. อเล็กซานเดอร์ เอ็ม. เจมสัน (Prof. Alexander M. Jamieson) และ ผศ. ดร. สุจิตรา วงศ์เกษมจิต และ รศ. ดร. อนุวัฒน์ ศิริวัฒน์, 120 หน้า, ISBN 974-638-519-4

โดยทั่วไปแล้ว การเตรียมสารประกอบอลูมาทรนมักต้องเสียค่าใช้จ่ายสูง เนื่องจากเป็นการสังเคราะห์ที่ค่อนข้างยุ่งยากและใช้สารตั้งต้นที่มีราคาแพง เมื่อเร็ว ๆ นี้ ได้มีการพัฒนาวิธีการสังเคราะห์สารประกอบอลูมาทรนด้วยวิธีใหม่ที่สะดวกและประหยัดจากอลูมินัมไฮดรอกไซด์ และ ไตรไอโซโพรพานอลามีน ซึ่งสารตั้งต้นทั้งสองมีราคาไม่สูง และหาได้ง่าย นอกจากนี้ยังพบว่าไตรเอทิลีนเตตระมีนซึ่งเป็นเบสที่แรงกว่าไตรไอโซโพรพานอลามีนเป็นตัวเร่งอัตราการละลายของอลูมินัมไฮดรอกไซด์อีกด้วย ผลึกภัณฑ์ที่ทำการสังเคราะห์ได้นั้น จะนำมาศึกษาถึงสมบัติของผลึกภัณฑ์โดยใช้ TGA, FTIR และ $^1\text{H-NMR}$ นอกจากนี้ยังได้ทำการศึกษาสมบัติทางวิสโคเมตริกของผลึกภัณฑ์ในสารละลายเจือจาง โดยอาศัยการวัดความหนืดที่แปรผันกับความเข้มข้นของไตรไอโซโพรพานอลามีน ระยะเวลาในการทำปฏิกิริยา อุณหภูมิที่ใช้ในการทำปฏิกิริยา และความเข้มข้นของตัวเร่งปฏิกิริยา จากการศึกษาพบว่าค่าความหนืดจำเพาะและค่าความเข้มข้นวิกฤตเปลี่ยนแปลงไปตามองค์ประกอบในการทำปฏิกิริยา โดยผลึกภัณฑ์ที่มีสารอินทรีย์เป็นองค์ประกอบเป็นปริมาณมาก จะมีค่าความหนืดสูง รัศมีไฮโดรไดนามิกส์ของผลึกภัณฑ์ที่สังเคราะห์ได้นั้น ได้ทำการศึกษาโดยใช้ dynamic light scattering โดยทำการวัดถึงผลของปริมาณสารตัวเร่งปฏิกิริยา และพบว่าผลึกภัณฑ์ที่สังเคราะห์ ได้จากปฏิกิริยาที่มีไตรเอทิลีนเตตระมีนเป็นตัวเร่งปฏิกิริยา จะให้รัศมีไฮโดรไดนามิกส์ขนาดใหญ่กว่า ซึ่งหมายถึงพอลิเมอร์ที่มีน้ำหนักโมเลกุลสูง ได้ถูกสังเคราะห์ขึ้นด้วย

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