

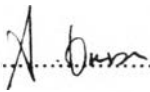
**Synthesis of Alumatrane Complexes Directly from
Al(OH)₃ and Triisopropanolamine**

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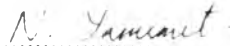
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ABSTRACT

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YUKOLTORN OPORNSAWAD : SYNTHESIS OF
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Preparations of alumatrane complexes generally are high cost because of multistep synthesis and expensive starting materials. 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 and readily available. When 45.5 mmol of $\text{Al}(\text{OH})_3$ are reacted with 70 mmol of TIS at 200°C , the reaction is complete in 3 h. The product can be purified by precipitation. Triethylenetetramine (TETA), a stronger base than TIS, was found to accelerate the dissolution rate of $\text{Al}(\text{OH})_3$.

The kinetics of TIS-Al formation were studied and TIS-Al was fully characterized using DSC, TGA, FAB^+ -MS, NMR (^1H -, ^{13}C -, ^{27}Al -), and FTIR. The integral method was used to study the dissolution kinetics as a function of different conditions. The activation energy of reaction was $24 \pm 2 \text{ kJ mol}^{-1}$.

บทคัดย่อ

ยุทธธร โอปรสวัสดิ์ : การสังเคราะห์สารประกอบอลูมาเทรนโดยตรงจากอลูมินัม

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โดยทั่วไปแล้ว การเตรียมสารประกอบอลูมาเทรนมักต้องเสียค่าใช้จ่ายที่สูง ทั้งนี้เพราะเป็นการสังเคราะห์ที่ค่อนข้างยุ่งยากและสารตั้งต้นที่ใช้มีราคาแพง เมื่อเร็ว ๆ นี้ ได้มีการพัฒนาวิธีการสังเคราะห์สารประกอบอลูมาเทรนด้วยวิธีใหม่ที่สะดวกและประหยัดจากอลูมินัมไฮดรอกไซด์ และไตรไอโซโพรพานอลามีน ซึ่งสารตั้งต้นทั้งสองมีราคาไม่สูง และหาได้ง่าย โดยนำอลูมินัมไฮดรอกไซด์ 45.5 มิลลิโมล มาทำปฏิกิริยากับไตรไอโซโพรพานอลามีน 70 มิลลิโมล ที่อุณหภูมิ 200 องศาเซลเซียส ปฏิกิริยาเสร็จสมบูรณ์ภายในเวลา 3 ชั่วโมง นำผลิตภัณฑ์ที่ได้ไปทำให้บริสุทธิ์โดยการตกตะกอน นอกจากนี้ยังได้พบว่าไตรเอทิลีนเดทอะมินซึ่งเป็นเบสที่แรงกว่าไตรไอโซโพรพานอลามีนเป็นตัวเร่งอัตราการละลายของอลูมินัมไฮดรอกไซด์อีกด้วย

ได้มีการศึกษาจลนศาสตร์ของการเกิดสารประกอบอลูมาเทรน และการตรวจสอบโครงสร้าง พร้อมทั้งศึกษาสมบัติของผลิตภัณฑ์โดยใช้ DSC, TGA, FAB⁺-MS, NMR (¹H-, ¹³C-, ²⁷Al-), และ FTIR ได้นำวิธีอินทิกรัลมาใช้ในการศึกษาจลนศาสตร์ของการละลายในตัวแปรต่าง ๆ พลังงานกระตุ้นของปฏิกิริยามีค่าเท่ากับ 24 ± 2 กิโลจูล ต่อโมล

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