

**STUDIES ON DEGRADATION INHIBITORS FOR AMINE BASED
SOLVENTS FOR CARBON DIOXIDE ABSORPTION FROM POWER
PLANT FLUE GASES**



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ABSTRACT

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Degradation of monoethanolamine during CO₂ absorption from power plant flue gases can cause significant problems in CO₂ capture process from flue gases. This work focused on developing degradation prevention or minimization techniques using degradation inhibitors. Various chemical additives were screened and tested as potential degradation inhibitors which are inhibitors UR-A, UR-B, UR-C and UR-D in the system of MEA-H₂O-O₂, MEA-H₂O-O₂-SO₂ and MEA-H₂O-O₂-SO₂-CO₂. HPLC-RID with nucleosil column/KH₂PO₄ mobile phase was capable of analyzing the degradation of MEA. The results showed that all of the degradation inhibitors were very effective in minimizing the rate of MEA degradation in the presence of O₂, SO₂ and CO₂ when used at their optimum concentrations. The highest reduction of MEA degradation rate was found to obtain at the optimum concentration of inhibitor UR-A, UR-B and UR-C of 0.05, 0.01 and 0.0025 kmol/m³, respectively. The highest reduction of MEA degradation rate was found to obtain at the optimum concentration of inhibitor UR-D in the presence of both O₂ and SO₂ at the optimum concentration of 0.025 kmol/m³.

บทคัดย่อ

ปुरुเชษฐ์ ปิติพิชญ์ : การศึกษาสารยับยั้งการเกิดปฏิกิริยาแยกสลายของ สารเอมีน ระหว่างการจับก๊าซคาร์บอนไดออกไซด์จากก๊าซของเสียที่ถูกสกัดจากโรงไฟฟ้าพลังงานถ่านหิน (Studies on Degradation Inhibitors for Amine Based Solvents for CO₂ Absorption from Power Plant Flue Gases) อาจารย์ที่ปรึกษา : รองศาสตราจารย์ ดร.จินตนา สายวรรณ ศาสตราจารย์ ดร.ไพฑูรย์ ดันติเวชวุฒิกุล และ ศาสตราจารย์ ดร.ราฟาเอล ไอเค็ม 105 หน้า

การแยกสลายของ สารโมโนเอทานอลามีนซึ่งเป็นสารในตระกูลเอมีนในระหว่างการจับก๊าซคาร์บอนไดออกไซด์จากก๊าซของเสียที่ถูกสกัดจากโรงไฟฟ้าพลังงานถ่านหินนั้นเป็นสาเหตุที่ส่งผลให้เกิดปัญหาอย่างมากในระหว่างการดักจับก๊าซคาร์บอนไดออกไซด์ออกจากก๊าซของเสีย งานวิจัยนี้จึงได้ศึกษาวิธีป้องกันปฏิกิริยาการแยกสลายของ สารโมโนเอทานอลามีนโดยใช้สารยับยั้ง ซึ่งงานวิจัยนี้ได้ศึกษาสารยับยั้งทั้งหมด 4 สารดังนี้ สารยับยั้ง UR-A (Inhibitor UR-A) สารยับยั้ง UR-B (Inhibitor UR-B) สารยับยั้ง UR-C (Inhibitor UR-C) และ สารยับยั้ง UR-D (Inhibitor UR-D) ในระบบที่มี MEA-H₂O-O₂ MEA-H₂O-O₂-SO₂ และ MEA-H₂O-O₂-SO₂-CO₂ อีกทั้งยังวิเคราะห์หาอัตราการเกิดปฏิกิริยาแยกสลายของ โมโนเอทานอลามีน โดยใช้เครื่องมือวิเคราะห์ขั้นสูง HPLC-RID ร่วมกับคอลัมน์นิวคลีโอซิล (Nucleosil) โดยมีเฟสเคลื่อนที่ KH₂PO₄ ผลการทดลองบ่งชี้ว่าสารยับยั้งทั้งหมดที่ใช้ในการศึกษานั้นสามารถลดอัตราการเกิดปฏิกิริยาแยกสลายของสารโมโนเอทานอลามีนในระบบที่มีก๊าซ ออกซิเจน ซัลเฟอร์ไดออกไซด์และคาร์บอนไดออกไซด์ได้ โดยสารยับยั้ง UR-A UR-B และ UR-C สามารถลดอัตราการเกิดปฏิกิริยาแยกสลายของสารโมโนเอทานอลามีน เมื่อใช้ที่ความเข้มข้นที่ 0.05 0.01 และ 0.0025 kmol/m³ ตามลำดับ อีกทั้งสารยับยั้ง UR-D สามารถลดอัตราการเกิดปฏิกิริยาแยกสลายของสารโมโนเอทานอลามีน ในระบบที่มีก๊าซ ออกซิเจนและ ซัลเฟอร์ไดออกไซด์ เมื่อใช้ที่ความเข้มข้นที่ 0.025 kmol/m³

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