

**CARBON DIOXIDE REMOVAL FROM FLUE GAS USING HYBRID  
SOLVENT ABSORPTION**



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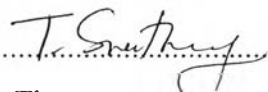
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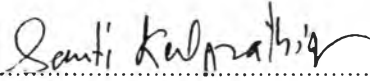
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## บทคัดย่อ

มารिता รัตนาคม : การแยกก๊าซคาร์บอนไดออกไซด์ออกจากฟลูว์ก๊าซโดยใช้กระบวนการดูดซับด้วยตัวทำละลายผสม (Carbon Dioxide Removal from Flue Gas Using Hybrid Solvent Absorption) อ. ที่ปรึกษา : ผศ. ดร. ธรรมนุญ ศรีทวงศ์ ศ. ดร. สุเมธ ชวเดช และ ดร. สันติ กุลประทีปปัญหา 46 หน้า

โดยปกติแล้วฟลูว์ก๊าซที่ถูกปล่อยออกสู่บรรยากาศมาจากอุตสาหกรรมเป็นส่วนใหญ่ซึ่งรวมไปถึงโรงงานอุตสาหกรรมปิโตรเคมี ฟลูว์ก๊าซประกอบด้วยก๊าซไนโตรเจนประมาณร้อยละ 80, ก๊าซคาร์บอนไดออกไซด์ประมาณร้อยละ 15, และก๊าซออกซิเจนประมาณร้อยละ 5 ซึ่งฟลูว์ก๊าซที่ได้จากการเผาไหม้เชื้อเพลิงฟอสซิลจะประกอบไปด้วยก๊าซคาร์บอนไดออกไซด์ ซึ่งก่อให้เกิดปรากฏการณ์เรือนกระจก ในการลดปริมาณการปล่อยก๊าซเรือนกระจก กระบวนการดูดซับด้วยตัวทำละลายของเหลวถือเป็นเทคโนโลยีทางการค้าที่สำคัญที่สุดในการกำจัดก๊าซคาร์บอนไดออกไซด์ เนื่องจากมีประสิทธิภาพสูง ตัวทำละลายที่นิยมใช้กันอย่างกว้างขวางคือโมโนเอทานอลเอมีน นอกจากนี้เอมีนที่มีตัวขัดขวางและไดเอมีนยังได้รับความสนใจใช้เป็นตัวทำละลายเนื่องจากมีค่าความจุในการดูดซับและความต้านทานต่อการย่อยสลายสูง ดังนั้นวัตถุประสงค์ของงานนี้คือเพื่อศึกษาตัวทำละลายผสมที่เหมาะสมระหว่างโมโนเอทานอลเอมีนและตัวทำละลายเอมีนอื่น ๆ โดยผลการทดลองพบว่าตัวทำละลายโมโนเอทานอลเอมีนที่มีความเข้มข้นร้อยละ 30 โดยน้ำหนักนอกจากจะมีประสิทธิภาพในการกำจัดก๊าซคาร์บอนไดออกไซด์สูงสุดแล้ว ยังมีอัตราการดูดซับและความจุในการดูดซับก๊าซคาร์บอนไดออกไซด์สูงด้วย นอกจากนี้เมื่อมีการผสมโมโนเอทานอลเอมีนกับตัวทำละลายเอมีนอื่นๆในสัดส่วนที่เหมาะสมพบว่า เมื่อผสมตัวทำละลายเอมีนอื่นๆลงไปจะส่งผลให้ทั้งอัตราการดูดซับและความจุในการดูดซับมีแนวโน้มเพิ่มขึ้น

## ABSTRACT

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Keywords: Carbon dioxide/ Monoethanolamine/ Sterically hindered amine/ Piperazine/ Solvent absorption

Normally, flue gas released into the atmosphere from most industries, including the petrochemical industry, contains approximately 80 % N<sub>2</sub>, 15 % CO<sub>2</sub>, and 5 % O<sub>2</sub>. The flue gas produced by the combustion of fossil fuels, which is composed of CO<sub>2</sub>, is therefore considered to cause the greenhouse effect. To reduce greenhouse gas emission, the liquid solvent absorption process, the most important commercial technology for CO<sub>2</sub> removal, can be efficiently applied. The widely used solvent is monoethanolamine (MEA). Sterically hindered amines and diamines have also been introduced because of their advantages in high absorption capacity and high degradation resistance. Hence, the aim of this work was to investigate hybrid solvents blended between MEA and other amine additives. The experimental results showed that the MEA aqueous solvent with MEA concentration of 30 wt.% provided the maximum CO<sub>2</sub> removal efficiency, as well as high CO<sub>2</sub> absorption rate and CO<sub>2</sub> loading capacity. When MEA was blended with a suitable amine additive at an appropriate blending ratio, both the absorption rate and CO<sub>2</sub> loading capacity tended to increase.

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