

**COMPARATIVE STUDY ON THE EFFECTS OF HOLLOW SILICA AND
ACTIVATED CARBON ON METHANE HYDRATE
FORMATION AND DISSOCIATION**

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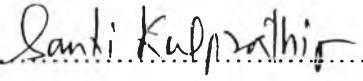
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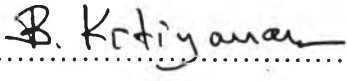
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ABSTRACT

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Keywords: Methane storage/ Hydrate/ Hollow silica/ Activated carbon

Both hollow silica and activated carbon are attractive porous media because of their high specific area, high porosity, and high adsorption gas capacity. The methane hydrate formation and dissociation were compared between the system with hollow silica and activated carbon. The formation experiment was conducted in the quiescent condition and closed system at 8 MPa and 6 MPa and 4°C. The dissociation experiment was conducted after the formation was completed at 6.5 MPa and 5 MPa with the driving force of 21°C. Results showed that the temperature profiles and rate of methane hydrate formation between activated carbon and hollow silica systems are different. The hydrate formation at 6 MPa gave lower conversion than that at 8 MPa in the system with activated carbon, but the different of experimental pressure not effect to the conversion in hollow silica system. The methane gas recovery in the system with hollow silica is higher than the activated carbon system. Therefore, hollow silica is an effective porous media for methane hydrate formation at lower pressure and also methane recovery than the activated carbon system. It may be concluded that the type and characteristics of porous media played a significant role on the methane hydrate formation and dissociation.

บทคัดย่อ

รวิปรีชา สื่อสวน: ศึกษาการเปรียบเทียบผลของการใช้ซิลิกาแบบกลวงกับถ่านกัมมันต์ ในการเกิดมีเทนไฮเดรตและการสลายตัวของมีเทนไฮเดรต (Comparative Study on the Effects of Hollow Silica and Activated Carbon on Methane Hydrate Formation and Dissociation) อ. ที่-
ปริक्षा: รศ. ดร. ปราโมช รังสรรค์วิจิตร และ ดร. สันติ กุลประทีปปัญญา 61 หน้า

ซิลิกาแบบกลวง (hollow silica) และถ่านกัมมันต์ (activated carbon) เป็นวัสดุที่มีรูพรุนที่น่าสนใจเนื่องจากมีพื้นที่ผิว ความเป็นรูพรุน และความสามารถในการดูดซับก๊าซที่สูง ในงานวิจัยนี้ได้เปรียบเทียบการเกิดและการสลายตัวของมีเทนไฮเดรต (methane hydrate) ระหว่างระบบที่มีซิลิกาแบบกลวงกับระบบที่มีถ่านกัมมันต์ ทดลองการเกิดของมีเทนไฮเดรตด้วยการใช้สภาวะนิ่งและระบบปิดที่ความดัน 8 MPa และ 6 MPa ที่ 4°C การศึกษาการสลายตัวของมีเทนไฮเดรตนั้นทำหลังจากการเกิดไฮเดรตเสร็จสิ้นโดยทำการทดลองที่ความดัน 6.5 MPa และ 5 MPa โดยมีอุณหภูมิขับเคลื่อน (driving force) 21°C ผลการทดลองแสดงให้เห็นว่ารูปแบบอนุภาครูพรุนและความแรงในการเกิดของมีเทนไฮเดรตในระบบที่มีซิลิกาแบบกลวงกับระบบที่มีถ่านกัมมันต์นั้นแตกต่างกัน และยังพบว่าเปอร์เซ็นต์การเกิดมีเทนไฮเดรตที่มีความดัน 6 MPa ของระบบที่มีถ่านกัมมันต์นั้นต่ำกว่าระบบที่มีความดันที่ 8 MPa ขณะเดียวกันพบว่าความแตกต่างของความดันนั้นไม่มีผลต่อการเกิดมีเทนไฮเดรตในระบบของซิลิกาแบบกลวง การสลายตัวของมีเทนไฮเดรตในระบบของซิลิกาแบบกลวงให้ปริมาณก๊าซมีเทนออกมามากกว่าระบบของถ่านกัมมันต์ ดังนั้นซิลิกาแบบกลวงนั้นเป็นวัสดุรูพรุนที่มีประสิทธิภาพสำหรับการเกิดมีเทนไฮเดรตที่ความดันต่ำกว่า และยังสามารถสลายตัวโดยให้ปริมาณก๊าซมีเทนที่มากกว่าระบบของถ่านกัมมันต์ ซึ่งการศึกษานี้ยังสามารถบอกได้ว่าชนิดและลักษณะของวัสดุรูพรุนนั้นมีผลเป็นอย่างมากต่อการเกิดและสลายตัวของมีเทนไฮเดรต

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