

MODIFIED PVDF/PAN FOR A PROTON EXCHANGE MEMBRANE



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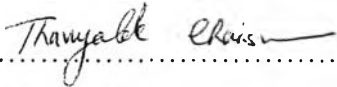
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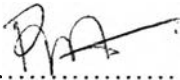
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ABSTRACT

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Keyword: Polyvinylidene fluoride/Antimony modified titanium dioxide/Polyacrylonitrile/Proton exchange membrane fuel cell

Composite film fabricated from 5 mol% antimony in titanium dioxide powder and polymers, polyvinylidene fluoride (PVDF) and polyvinylidene fluoride (PVDF)/polyacrylonitrile (PAN) blends are a new challenge in proton exchange membrane fuel cells to substitute for Nafion. The ceramic was prepared via the sol-gel method and calcined at 500 °C. The anatase structure of antimony modified titania was investigated by XRD. The presence of antimony in titania provides higher porosity and higher specific surface area. The composite membranes were fabricated by solvent casting using DMF as a solvent. These membranes were evaluated for their potential use as an electrolyte in PEMFCs by using impedance spectroscopy, water uptake, TGA, and a Lloyd Universal Testing Machine. The results showed that the impedance and the percentage of water uptake of PVDF composite membranes were improved by blending with PAN and higher contents of 5 mol% Sb-doped TiO₂.

บทคัดย่อ

ณัฐกานต์ อภิการักษ์ : การดัดแปลงพีวีดีเอฟ/พีเอเอ็นเพื่อนำไปใช้ทำเป็นเยื่อแลกเปลี่ยนโปรตอน (Modified PVDF/PAN for a Proton Exchange Membrane) อ. ที่ปรึกษา: ผู้ช่วยศาสตราจารย์ ดร. หทัยกานต์ มนัสปิยะ 77 หน้า

งานวิจัยนี้เป็นการพัฒนาเซลล์เชื้อเพลิงแบบเยื่อแลกเปลี่ยนโปรตอน เพื่อนำมาทดแทนการใช้แนฟฟิออน โดยการนำเซรามิก 5 โมล% ของพลวงไนโททานเนียมไดออกไซด์ มาผสมกับพอลิเมอร์ พอลิไวนิลลิคีนฟลูออไรด์ และ พอลิเมอร์ผสมระหว่างพอลิไวนิลลิคีนฟลูออไรด์กับพอลิอะคริโลไนไตรด์ ซึ่งการเตรียมเซรามิกชนิดนี้ เตรียมผ่านวิธีโซลเจลและเผาที่อุณหภูมิ 500 องศาเซลเซียส การศึกษาโดยใช้เทคนิค XRD พบว่า 5 โมล% ของพลวงไนโททานเนียมไดออกไซด์ มีโครงสร้างแบบอะนาทาส และการที่มีพลวงอยู่ในโททานเนียมไดออกไซด์จะทำให้เซรามิกมีความเป็นรูพรุนสูงขึ้นและมีพื้นที่ผิวมากขึ้น คอมพอสิตเมมเบรนเตรียมโดยการใช้วิธีการขึ้นรูปด้วยตัวทำละลายซึ่งมี DMF เป็นตัวทำละลาย เมมเบรนที่เตรียมได้จะนำไปทดสอบประสิทธิภาพการทำงานเป็นสารพาประจุในเซลล์เชื้อเพลิง โดยการวัดค่าความต้านทาน การวัดค่าการดูดซับน้ำ การทดสอบสมบัติทางความร้อนโดยใช้เทคนิค TGA และการทดสอบสมบัติเชิงกล ซึ่งพบว่าการทำคอมพอสิตกับ 5 โมล% ของพลวงไนโททานเนียมไดออกไซด์ และทำพอลิเมอร์ผสมกับพอลิอะคริโลไนไตรด์ ทำให้คอมพอสิตของพอลิไวนิลลิคีนฟลูออไรด์มีการปรับปรุงค่าความต้านทานและค่าการดูดซับน้ำได้ดีขึ้น

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