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**EFFECT OF METAL SALT ON PHYSICAL PROPERTIES  
OF PVA FILM**

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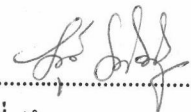
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ได้มีการศึกษา ผลของเกลือโลหะที่มีต่อสมบัติทางกายภาพของฟิล์มพีวีเอ โดยการเตรียมฟิล์มพีวีเอ และฟิล์มพีวีเอผสมเกลือโลหะคลอไรด์ต่างๆชนิด ในปริมาณต่างๆกัน ซึ่งได้แก่ เกลือลิเทียมคลอไรด์, เกลือโซเดียมคลอไรด์, เกลือโปแตสเซียมคลอไรด์, เกลือแคลเซียมคลอไรด์, เกลือแบเรียมคลอไรด์, เกลือเฟอรัสคลอไรด์, เกลือเฟอร์ริกคลอไรด์, เกลือคอปเปอร์คลอไรด์, เกลือสังกะสีคลอไรด์, เกลือโคบอลต์คลอไรด์ และเกลือนิกเกิลคลอไรด์ ตามลำดับ จากนั้นนำฟิล์มที่อบแห้งแล้วไปทำการตรวจสอบผลของเกลือที่มีต่อสมบัติทางกายภาพของฟิล์มด้วยเทคนิคต่างๆ กัน ได้แก่ UV-VIS spectroscopy, IR spectroscopy, ATR-FTIR spectroscopy, FTIR spectroscopy, Raman spectroscopy, DMTA, Tensile testing, Water absorption, Organic solvent absorption และ Optical microscopy ปรากฏผลที่ค่อนข้างสอดคล้องกัน ซึ่งพอจะสรุปได้ว่า มีอันตรกิริยาระหว่างไอออนของโลหะกับหมู่ไฮดรอกซิล และ/หรือ หมู่อะซีเตตที่หลงเหลือในสายโซ่ของพีวีเอ โดยปริมาณการเปลี่ยนแปลงสมบัติทางกายภาพต่างๆ ของฟิล์มพีวีเอแปรเปลี่ยนตามชนิดเกลือที่มีอยู่ในฟิล์ม กล่าวคือ UV-VIS absorption spectra ของเกลือบางชนิดปรากฏ absorption band ที่ความยาวคลื่นต่างจาก absorption spectra ของฟิล์มพีวีเอ เปอร์เซ็นต์ความเป็นผลึกของฟิล์มซึ่งคำนวณจาก IR spectra มีแนวโน้มลดลงเมื่อปริมาณเกลือในฟิล์มเพิ่มขึ้น อุณหภูมิ Tg, ค่า bending modulus, ค่า tensile properties และความสามารถในการดูดซับน้ำและตัวทำละลายอินทรีย์มีแนวโน้มเปลี่ยนแปลงตามชนิดและปริมาณของเกลือในฟิล์ม นอกจากนี้ผลจากการศึกษา optical microscopy พบว่าการกระจายตัวของเกลือโลหะภายในฟิล์มมีความเป็นระเบียบมากขึ้นภายหลังการตั้ง

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Effect of metal salt on physical properties of PVA films was investigated by preparing PVA films containing various types and contents of metal salt. The metal salts used in the present study were LiCl, NaCl, CaCl<sub>2</sub>, BaCl<sub>2</sub>, FeCl<sub>2</sub>, FeCl<sub>3</sub>, CuCl<sub>2</sub>, ZnCl<sub>2</sub>, CoCl<sub>2</sub> and NiCl<sub>2</sub>, respectively. Then the dried films were separately used for studying effect of each metal salt with the following techniques : UV-VIS spectroscopy, IR spectroscopy, ATR-FTIR spectroscopy, FTIR spectroscopy, Raman spectroscopy, DMTA, Tensile testing, Water absorption, Organic solvent absorption and Optical microscopy. All of the results were mostly corresponding which can be concluded that there was interaction of metal ions with hydroxyl groups and/or residual acetate groups in PVA. The results also indicated that most of physical properties of PVA films tend to depend on metal content in the films. From UV-VIS absorption spectra, it was found that the PVA films containing some salts such as FeCl<sub>2</sub>, FeCl<sub>3</sub>, CuCl<sub>2</sub>, ZnCl<sub>2</sub>, CoCl<sub>2</sub> and NiCl<sub>2</sub> showed different absorption band from the spectra of PVA film. Percentage of crystallinity calculated from IR spectra tended to decrease with the content of metal in the films. Tg, bending modulus, tensile properties, water and organic solvent absorption tended to depend both on types and content of metal salt in the films. In addition, optical microscopic study shows distribution of PVA films containing metal salt is more regularity after tension testing.



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ลายมือชื่อนิติกร

ลายมือชื่ออาจารย์ที่ปรึกษา

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม



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## ABBREVIATIONS

ATR-FTIR	attenuated total reflectance
Ba	barium
Ca	calcium
cm <sup>-1</sup>	per centimeter
Co	cobalt
Cu	copper
DMTA	dynamic mechanical thermal analysis
EMAA	ethylene-methacrylic acid copolymer
Fe(II)	iron (II)
Fe(III)	iron (III)
FTIR	fourier transform infrared
IR	infrared
K	potassium
Li	lithium
min	minute
MPA	megapascal
Na	sodium
Ni	nickel
nm	nanometer
PAA	poly (acrylic acid)
PE	polyethylene
PLA	poly (L-glutamic acid)
PMA	poly (methacrylic acid)
PMMA	poly (methyl methacrylate)

**ABBREVIATIONS (continued)**

PNVC	poly (vinyl carbozole)
PS	polystyrene
PVA	poly (vinyl alcohol)
PVC	poly (vinyl chloride)
Tg	glass transition temperature
THF	tetrahydrofuran
UV-VIS	ultraviolet-visible
Zn	zinc