

**DEVELOPMENT OF NOVEL POLYMERIC MATERIALS FOR
BIOMEDICAL APPLICATIONS**

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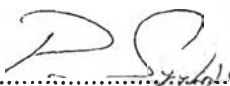
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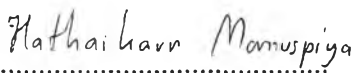
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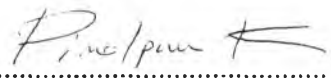

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ABSTRACT

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The study and the synthesis of novel polymeric materials is an extremely challenging research topic, which were divided into three prospective application of biomaterials including an effectual wound dressing material, an artificial nerve and scaffold for bone regeneration. First part, an antibacterial wound dressings were successfully prepared using two technique i.e. solvent casting process and gamma radiation. The materials (copper (II) alginate and copper (II) stearate/PVP hydrogel pad) exhibited the good antibacterial activity against *E.coli*, *S. aureus*, *MRSA*, *S. epidermidis*, *S.pyogenes*. The materials provided excellent liquid absorption properties. WVTR information showed the ability to allow water vapor to pass through the sample and prevention of agglomeration of exudates that promoted accelerated wound healing. Both of materials can possibly be applied for use as an antibacterial wound dressing base on their low-toxicity for skin cells (fibroblasts) and excellent anti- bacterial activity. Second part, the nanofibrous PAA tube showed the responsive to ions change in the medium which was clearly showed the cycle of shrinkage and expansion during ions exchange occurred. The rapid responsive of the Na/Ca exchange of the PAA tube was occurred when using physiological salt concentration of the human body (150 mM NaCl) as an immersion medium which can be related to to ions influx of an living axon. Third part, the antioxidant scaffold was prepared from gallic acid and collagen-I scaffolds using the amine-reactive-NHS ester solution which provided excellent and stable scavenging activity depending on the usage of GA concentration. The study model of cell activities after applied stress was showed the impressively high cell growth when using GA 20 for HDFa and young MSCs and GA 40 for aged MSCs.

บทคัดย่อ

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คำสำคัญ: การประยุกต์ใช้ทางการแพทย์/ไฮโดรเจล/ การต่อต้านเชื้อแบคทีเรีย/ แผ่นปิดแผล/
เส้นประสาทเทียม/การสร้างกระดูก

ในการพัฒนาวัสดุพอลิเมอร์ให้มีคุณสมบัติที่เหมาะสมในการประยุกต์ใช้ทางการแพทย์ เป็นเรื่องที่ทำหาย ในงานวิจัยขั้นนี้ศึกษาและพัฒนาวัสดุพอลิเมอร์เพื่อนำไปใช้ประโยชน์ทางด้านการแพทย์ การพัฒนาวัสดุทางการแพทย์นั้นขึ้นอยู่กับความผิดปกติของคนไข้และการใช้งาน อาทิ การพัฒนาวัสดุปิดแผลที่มีคุณสมบัติต่อต้านเชื้อแบคทีเรียและมีความสามารถในการรักษาความชุ่มชื้นให้กับแผลได้ ซึ่งในงานวิจัยขั้นนี้สนใจสมบัติการต่อต้านเชื้อแบคทีเรียของทองแดง และนำมาประกอบกับ ความสามารถในการดูดซับน้ำและรักษาความชุ่มชื้นของแผล ของ อัลจินเนต และ พอลิไวนิลไพโรลิโดน ผลการทดสอบการต่อต้านเชื้อแบคทีเรียให้ผลที่ดีมาก ทั้งยังมีความสามารถในการดูดซับน้ำอีกด้วย นอกจากนี้งานวิจัยขั้นนี้ได้พัฒนาวัสดุพอลิเมอร์ในการประยุกต์ใช้เป็นเส้นประสาทเทียม โดยการสร้างเส้นใยขนาดเล็กของพอลิอะคลิลิกแอซิด และได้ทำการทดสอบการเปลี่ยนแปลงแบบผันกลับได้ในการแลกเปลี่ยนไอออน ซึ่งผลเป็นที่น่าพอใจ จึงเป็นไปได้ว่า วัสดุชนิดนี้สามารถพัฒนาเป็นเส้นประสาทเทียมและใช้ได้จริง การพัฒนากระดูกเทียมของงานวิจัยขั้นนี้เตรียมได้จากคอลลาเจนเคลือบด้วยสารแกลลิกแอซิด การศึกษาพฤติกรรมระดับเซลล์เมื่อถูกเลี้ยงบนคอลลาเจนที่ถูกพัฒนาให้มีความสามารถในการต่อต้านอนุมูลอิสระ โดยใช้แกลลิกแอซิดเปรียบเทียบกับคอลลาเจนที่ไม่ได้รับการพัฒนาพบว่าเซลล์สามารถเจริญเติบโตได้ดีขึ้นอย่างมีนัยสำคัญ

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