

**SURFACE MODIFICATION OF POLY(STYRENE/ETHYLENE GLYCOL
DIMETHACRYLATE) HIPE LOADED WITH HYDROXYAPATITE AS A
SCAFFOLD FOR TISSUE ENGINEERING APPLICATION**

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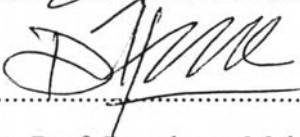
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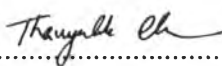

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ABSTRACT

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Poly(High Internal Phase Emulsion) (PolyHIPE) foam is a material that is good candidate for used in tissue engineering application due to its 3D structure and highly porous with interconnected pore. The PolyHIPE was prepared from poly(styrene/ethylene glycol dimethacrylate; 80/20) through high internal phase emulsion polymerization technique and loaded with hydroxyapatite (HA) to improve biocompatibility. In this study, improvement of hydrophilicity of the polyHIPE was carried out by Layer-by-Layer method. Three types of chemicals were used for coating on the surface of polyHIPE such as poly(sodium 4-styrene sulfonate) (PSS), gelatin, and alginic acid. The change of surface properties of the modified polyHIPE was characterized by contact angle measurement. It was found that hydrophilicity of the surface increase after coating as observed by decrease in contact angle degree. The effect of type of coating on cell attachment and cell proliferation was also studied. The PSS modified polyHIPE showed the highest efficiency of attachment of the L929 fibroblast cells and an amount of cell increased up to 138% when compare with unmodified the polyHIPE. Moreover, the PSS modified polyHIPE also exhibited the highest efficiency of proliferation of the L929 fibroblast cells. Therefore, PSS modified polyHIPE was suitable for using in tissue engineering application.

บทคัดย่อ

กรรณก นวลตา : การดัดแปรผิวหน้าของพอลิฮีพที่มีการเติมไฮดรอกซีแอปาทิตสำหรับประยุกต์ใช้เป็นโครงเลี้ยงเซลล์ในวิศวกรรมเนื้อเยื่อ (Surface Modification of Poly(S/EGDMA)HIPE Loaded with Hydroxyapatite as a Scaffold for Tissue Engineering Application) อ. ที่ปรึกษา ผศ. ดร. มานิตย์ นิธิรนากุล ผศ. ดร. ปมทอง มาลากุล ณ อยุธยา และ ดร. สเตฟาน ที่ดูบาส จำนวน 43 หน้า

พอลิฮีพเป็นวัสดุที่มีคุณสมบัติที่ดีที่สามารถนำมาใช้ในวิศวกรรมเนื้อเยื่อ เนื่องจากพอลิฮีพมีโครงสร้างเป็นสามมิติ และมีรูพรุนมากและต่อเนื่องกัน พอลิฮีพถูกเตรียมจากสไตรีนและเอทิลีนไกลคอลไดเมทาไครเลตในอัตราส่วน 80 ต่อ 20 โดยใช้วิธีพอลิเมอไรเซชันของอิมัลชันที่มีวัฏภาคภายในสูง และมีการเติมไฮดรอกซีแอปาทิตเพื่อเพิ่มความเข้ากันได้กับเนื้อเยื่อในร่างกาย ในงานวิจัยนี้ ทำการปรับปรุงคุณสมบัติความชอบน้ำของพอลิฮีพโดยใช้วิธีเลเซอร์บายเลเซอร์ สารเคมีที่ใช้ในการดัดแปรผิวหน้าของพอลิฮีพมี 3 ชนิด ได้แก่ พอลิสไตรีนซัลโฟเนต เจลาติน และอัลจินิก แอซิด คุณสมบัติของผิวหน้าที่เปลี่ยนไปของพอลิฮีพตรวจสอบโดยใช้เครื่องทดสอบมุมสัมผัส พบว่าความชอบน้ำของผิวหน้าเพิ่มขึ้นหลังจากมีการดัดแปรผิวหน้าซึ่งสังเกตได้จากองศาของมุมสัมผัสลดลง นอกจากนี้ยังได้ศึกษาผลของสารที่ใช้ในการดัดแปรผิวหน้าที่มีต่อการยึดติดของเซลล์และการเพิ่มจำนวนของเซลล์ พบว่าพอลิฮีพที่ทำการดัดแปรผิวหน้าด้วยพอลิสไตรีนซัลโฟเนตมีจำนวนเซลล์ยึดติดสูงที่สุด และมีปริมาณเซลล์ยึดติดเพิ่มขึ้น 138 เปอร์เซ็นต์เมื่อเปรียบเทียบกับพอลิฮีพที่ไม่ได้ทำการดัดแปรผิวหน้า นอกจากนี้ พอลิฮีพที่ทำการดัดแปรผิวหน้าด้วยพอลิสไตรีนซัลโฟเนตยังมีปริมาณการเพิ่มจำนวนของเซลล์มากที่สุดด้วย ดังนั้น พอลิฮีพที่ดัดแปรผิวหน้าด้วยพอลิสไตรีนซัลโฟเนตเหมาะสำหรับใช้ในวิศวกรรมเนื้อเยื่อ

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