

STRAIN SENSITIVE PHOTONIC NATURAL RUBBER

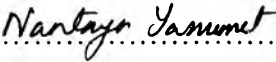
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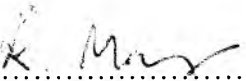
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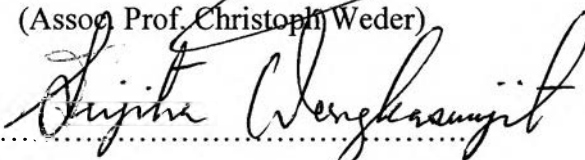
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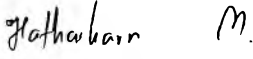

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ABSTRACT

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Photoluminescent polymers such as poly(p-phenylene vinylene) (PPV) and oligo(phenylene vinylene) (OPV) show good optical response and consequently can serve as active materials in sensor devices. Our objectives are to prepare, characterize, and develop a material for a deformation sensor. This sensor combines the properties of photoluminescent polymers, which emit light when excited by photons, and the elastic properties of natural rubber. Natural rubber, grafted with small amounts (0.5-4% w/w) of either PPV or OPV, was prepared by free radical polymerization using a classic initiator, AIBN. The important effects on the behavior of these materials are their compositions, the nature of the dyes, and the applying strain. Subjecting samples to mechanical deformation can significantly change the extent of molecular aggregation of the photoluminescent guest molecules, which in turn leads to a variation of the contributions of the monomer and excimer emission; therefore a change in color of the emission is possible.

บทคัดย่อ

เกศสุดา อนุชัย : การศึกษาแรงดึงที่มีผลต่อการเรืองแสงของยางธรรมชาติที่ถูกดัดแปรโครงสร้างโดยสีเรืองแสง (Strain Sensitive Photonic Natural Rubber) อ.ที่ปรึกษา : รศ.ดร. รัตนวรรณ มกรพันธุ์ และ รศ.ดร. คริสทอฟ เวเดอร์ 117 หน้า

พอลิเมอร์เรืองแสง เช่น พอลิพาราฟินิลีนไวนิลีน (พีพีวี) และ โอลิโกฟินิลีนไวนิลีน (โอพีวี) แสดงสมบัติทางแสงที่ดี จึงนำมาใช้เป็นวัสดุตอบสนองสำหรับอุปกรณ์ตรวจวัดวัตถุประสงค์ของงานนี้คือการเตรียม การตรวจวิเคราะห์เพื่อพัฒนาวัสดุสำหรับเป็นตัวตรวจวัดการเสียบรูป ตัวตรวจวัดนี้ได้รวมเอาสมบัติต่างๆของพอลิเมอร์เรืองแสงซึ่งเปล่งแสงเมื่อถูกกระตุ้นด้วยพลังงานแสงกับสมบัติการยืดหยุ่นของยางธรรมชาติ ยางธรรมชาติซึ่งกราฟกับพีพีวีหรือ โอพีวี จำนวนเล็กน้อย (0.5-4% น.น./น.น.) เตรียมได้โดยการใช้อนุมูลอิสระในการสังเคราะห์พอลิเมอร์ ซึ่งก็คือ AIBN ปัจจัยสำคัญที่มีผลต่อคุณสมบัติของวัสดุชนิดนี้คือ ปริมาณอัตราส่วนของพอลิเมอร์เรืองแสงและยางธรรมชาติ, ลักษณะเฉพาะของพอลิเมอร์เรืองแสงและแรงดึงที่กระทำต่อวัสดุ การทดลองพบว่าเมื่อเราดึงยืดชิ้นงานทำให้กลุ่มของพอลิเมอร์เรืองแสงที่เกาะกลุ่มกันเกิดการกระจายตัวซึ่งทำให้การเปล่งแสงเปลี่ยน โดยเปลี่ยนจากการเปล่งแสงของกลุ่มพอลิเมอร์เรืองแสงเป็นการเรืองแสงของมอนอเมอร์แทน จากการทดลองทั้งหมดที่กล่าวมาสามารถสรุปได้ว่ากราฟโคพอลิเมอร์ของสารเรืองแสงและยางธรรมชาติเป็นอีกทางเลือกหนึ่งที่จะสามารถนำไปพัฒนาเป็นวัสดุตรวจวัดการเสียบรูปได้

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ABBREVIATIONS

NR	=	Natural rubber
OPV	=	Oligo(p-phenylene inylene)
PL	=	Photoluminescence
PPV	=	Poly(p-phenylene vinylene)