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SYNTHESIS OF METAL-CONTAINING POLYURETHANE/CLAY
NANOCOMPOSITES

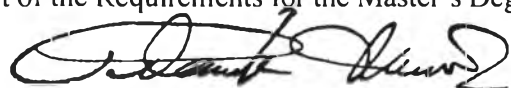
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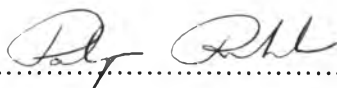
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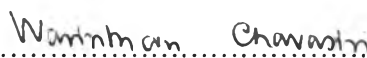
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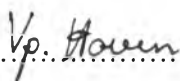
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นาโนคอมพอสิตของพอลิยูรีเทนที่มีโลหะและอ็อกไซด์ของโลหะถูกเตรียมขึ้นด้วยวิธีโซลูชันอินเทอร์คาเลชัน โดยใช้ปริมาณของอ็อกไซด์แตกต่างกัน อ็อกไซด์ที่ใช้ คือ เบนโทไนต์ ซึ่งได้เปลี่ยนพื้นผิวด้วยโอเลิลเมทิลบิส(2-ไฮดรอกซีเอทิล)แอมโมเนียมคลอไรด์ พอลิยูรีเทนที่มีโลหะสามารถสังเคราะห์จากปฏิกิริยาระหว่างสารประกอบเชิงซ้อนเฮกซาเดนเตดซิปเบสของโลหะสังกะสีกับพรีพอลิเมอร์ชนิดที่มีหมู่ไอโซไซยานตเป็นหมู่ที่ปลายสายโซ่ ผลการศึกษาพอลิเมอร์นาโนคอมพอสิตที่เตรียมได้แสดงให้เห็นว่าพอลิยูรีเทนที่มีโลหะสามารถแทรกเข้าไปในระหว่างชั้นของอ็อกไซด์ซึ่งสามารถยืนยันด้วยการใช้เทคนิคการเลี้ยวเบนของรังสีเอ็กซ์และกล้องจุลทรรศน์อิเล็กตรอนแบบส่องผ่าน จากการศึกษาด้วยฟูเรียร์ทรานส์ฟอร์มอินฟราเรดสเปกโทรสโกปี ทำให้ทราบว่าความถี่ที่ขึ้นชิลิกेटของอ็อกไซด์ไม่ทำให้โครงสร้างของพอลิยูรีเทนที่มีโลหะในนาโนคอมพอสิตเปลี่ยนแปลง การศึกษาสมบัติความเสถียรต่อความร้อนและสมบัติการติดไฟของนาโนคอมพอสิตทำได้โดยใช้เทอร์โมกราวิเมตริกอะนาไลซิสและการวัดค่าลิมิติงออกซิเจนอินเดกซ์ตามลำดับ จากผลการศึกษาด้วยเทอร์โมกราวิเมตริกอะนาไลซิส พบว่าสมบัติของความเสถียรต่อความร้อนของนาโนคอมพอสิตไม่ดีกว่าพอลิเมอร์บริสุทธิ์ในช่วงอุณหภูมิต่ำ แต่จะดีกว่าพอลิเมอร์บริสุทธิ์ในช่วงอุณหภูมิสูง และนาโนคอมพอสิตสามารถทนต่อการติดไฟได้ดีกว่าพอลิเมอร์บริสุทธิ์ ผลการทดลองที่ได้จึงระบุว่า เกิดแรงดึงดูดระหว่างสายโซ่พอลิยูรีเทนที่มีโลหะและพื้นผิวของอ็อกไซด์เนื่องจากทั้งคู่มีส่วนที่มีขั้ว และนอกจากนี้ ปริมาณของอ็อกไซด์ที่เติมลงไปยังส่งผลถึงสมบัติทางด้านความร้อนของพอลิเมอร์นาโนคอมพอสิตอีกด้วย

สาขาวิชา...ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์...ลายมือชื่อนิสิต.....ศศิกานต์ สุวรรณประทีป
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KEY WORD: POLYURETHANE NANOCOMPOSITES / INTERCALATED POLYMERS / METAL-CONTAINING POLYURETHANE

SASIKAN SUWANPRATEEP : SYNTHESIS OF METAL-CONTAINING POLYURETHANE/CLAY NANOCOMPOSITES. THESIS ADVISOR : ASSOC. PROF. NUANPHUN CHANTARASIRI, Ph. D., 72 pp. ISBN 974-53-2408 -6.

The metal-containing polyurethane/organoclay nanocomposites with varying contents of organoclay were prepared *via* solution intercalation. The organoclay employed was bentonite, whose surface was modified by oleylmethylbis(2-hydroxyethyl)ammonium chloride (OMH). Metal-containing polyurethane has been synthesized by the reaction between hexadentate Schiff base zinc complexes and isocyanate-terminated prepolymers. The study results of nanocomposites showed that the metal-containing polyurethane intercalated into the layers of organoclay, which was confirmed by X-ray diffraction (XRD) and transmission electron microscopy (TEM). The structure of metal-containing polyurethanes in the nanocomposites was not changed by the presence of the organoclay silicate layers as evidenced by Fourier transform infrared spectroscopy (FTIR). Thermal stability and flammability of the nanocomposite were studied by thermogravimetric analysis (TGA) and measuring limiting oxygen index (LOI) values, respectively. TGA results indicated that the thermal stability of nanocomposites was not superior to that of the pure polymer at low temperature, however, the nanocomposites had better thermal stability than the pure polymer at high temperature. The nanocomposites were found to be more flame retardant than the pure metal-containing polyurethanes. The experimental results indicated that there is interaction between metal-containing polyurethane chain and surface of organoclay because both of them contain polar species. The organoclay loading was found to have influence on thermal property of the nanocomposites.

Field of study. Petrochemistry and polymer science Student's signature..... *S. Suwanprateep*.....
Academic Year..... 2005..... Advisor's signature..... *N. Chantarasiri*.....

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LIST OF ABBREVIATIONS

BNH	bentonite H
DBTDL	dibutyltin dilaurate
DMSO	dimethylsulfoxide
FTIR	Fourier Transform Infrared Spectroscopy
LOI	limiting oxygen index
MSal ₂ trien	hexadentate Schiff base metal complex
NiSal ₂ trien	hexadentate Schiff base nickel complex
ODMH	octadecylmethyl[ethoxylate(15)] ammonium chloride
OMH	oleylmethylbis(2-hydroxyethyl)ammonium chloride
PB1600	poly(1,4-butanediol), tolylene 2,4-diisocyanate terminated, molecular weight 1600
PB1600Ni	nickel-containing polyurethane from NiSal ₂ trien and PB1600
PB1600Ni/BNH	nanocomposite of PB1600Ni with BNH organoclay
PB1600Zn	zinc-containing polyurethane from ZnSal ₂ trien and PB1600
PB1600Zn/BNH	nanocomposite of PB1600Zn with BNH organoclay
PB900	poly(1,4-butanediol), tolylene 2,4-diisocyanate terminated, molecular weight 900
PB900Ni	nickel-containing polyurethane from NiSal ₂ trien and PB900
PB900Ni/BNH	nanocomposite of PB900Ni with BNH organoclay
PB900Zn	zinc-containing polyurethane from ZnSal ₂ trien and PB900

PB900Zn/BNH	nanocomposite of PB900Zn with BNH organoclay
PP1000	poly(propylene glycol), tolylene 2,4-diisocyanate terminated, molecular weight 1000
PP1000Ni	nickel-containing polyurethane from NiSal ₂ trien and PP1000
PP1000Ni/BNH	nanocomposite of PP1000Ni with BNH organoclay
PP1000Zn	zinc-containing polyurethane from ZnSal ₂ trien and PP1000
PP1000Zn/BNH	nanocomposite of PP1000Zn with BNH organoclay
PP2300	poly(propylene glycol), tolylene 2,4-diisocyanate terminated, molecular weight 2300
PP2300Ni	nickel-containing polyurethane from NiSal ₂ trien and PP2300
PP2300Ni/BNH	nanocomposite of PP2300Ni with BNH organoclay
PP2300Zn	zinc-containing polyurethane from ZnSal ₂ trien and PP2300
PP2300Zn/BNH	nanocomposite of PP2300Zn with BNH organoclay
TEM	Transmission Electron Microscopy
TTM	tallowtrimethyl ammonium chloride
TGA	thermogravimetric analysis
XRD	X-ray Diffraction
ZnSal ₂ trien	hexadentate Schiff base zinc complex