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SYNTHESIS OF CHELATING POLYMER CONTAINING SCHIFF BASE AND SULFUR FOR HEAVY METAL ADSORPTION

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พอลิสไตรีนไดไวนิลเบนซีนที่มีหมู่แอลดีไฮด์ (CHO-PS-DVB) เตรียมได้จากปฏิกิริยาออกซิเดชันของพอลิสไตรีนไดไวนิลเบนซีนที่มีหมู่คลอโรเมทิล (Cl-PS-DVB) มีร้อยละผลิตภัณฑ์ประมาณ 57 และใช้เตรียมคีเลทิงเรซินใหม่สามชนิดด้วยปฏิกิริยาควบคู่ผ่านพันธะชิฟเบสสองพันธะกับลิแกนด์ที่สังเคราะห์สองชนิด คือ 2-[3-(2-amino ethylsulfanyl)-propylsulfanyl]-ethylamine (AEPE) และ 2-[2-(2-amino-ethylsulfanyl)-ethylsulfanyl]-ethylamine (AEEE) และลิแกนด์ที่มีจำหน่าย คือ triethylenetetramine (TETA) ซึ่งเรียกว่า AEPE-PS-DVB, AEEE-PS-DVB และ TETA-PS-DVB ตามลำดับ ยืนยันโครงสร้างของลิแกนด์ด้วยเทคนิคฟูริเออร์ทรานสฟอร์มอินฟราเรดสเปกโทรสโกปี และโปรตอนและคาร์บอนแมกเนติกเรโซแนนซ์สเปกโทรสโกปี ศึกษาผลของเวลาในการทำปฏิกิริยา อุณหภูมิ และปริมาณของลิแกนด์ พิสูจน์เอกลักษณ์ของอนุพันธ์เรซินทั้งหมดด้วยวิธีการวิเคราะห์ปริมาณของธาตุที่เป็นองค์ประกอบ การวิเคราะห์เชิงความร้อน ฟูริเออร์ทรานสฟอร์มอินฟราเรดสเปกโทรสโกปี รามานสเปกโทรสโกปี และการทดสอบนินไฮดริน ศึกษาสมบัติการดูดซับของเรซินที่สังเคราะห์ได้ต่อไอออนของตะกั่ว ทองแดง แคดเมียม สังกะสี นิกเกิล โคบอลต์ และโครเมียม ในน้ำด้วยระบบแบทช์ ค่าพีเอชที่เหมาะสมของไอออนทุกชนิดอยู่ในช่วง 5-7 สำหรับเรซินทุกชนิด AEPE-PS-DVB และ AEEE-PS-DVB แสดงพฤติกรรมการดูดซับแบบเดียวกัน และมีลำดับความจำเพาะต่อไอออนดังนี้ ตะกั่ว > สังกะสี > ทองแดง > แคดเมียม, โคบอลต์, นิกเกิล และโครเมียม ส่วน TETA-PS-DVB แสดงความจำเพาะต่อไอออนตะกั่วเท่านั้น

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PRADIT NUTTHANARA: SYNTHESIS OF CHELATING POLYMER CONTAINING SCHIFF BASE AND SULFUR FOR HEAVY METAL ADSORPTION. THESIS ADVISOR: ASSIST.PROF. APICHAT IMYIM, Ph.D., THESIS COADVISER: THANAPONG KREETHADUMRONGDAT, Ph.D., 89 pp.

Aldehydic polystyrene-divinylbenzene copolymer (CHO-PS-DVB) was initially prepared from the oxidation of chloromethylated polystyrene-divinylbenzene (Cl-PS-DVB) with approximately 57 % yield. The CHO-PS-DVB were subsequently used to prepare three new chelating resins by coupling reaction through a dual Schiff base linkage with two synthesized ligands; 2-[3-(2-amino ethylsulfanyl)-propylsulfanyl]-ethylamine (AEPE) and 2-[2-(2-amino-ethylsulfanyl)-ethylsulfanyl]-ethylamine (AEEE), and a commercial one; triethylenetetramine (TETA), called AEPE-PS-DVB, AEEE-PS-DVB and TETA-PS-DVB, respectively. The structure of the ligands was confirmed by FT-IR, ^{1}H-NMR and ^{13}C-NMR spectroscopic techniques. The effects of the reaction time, temperature and the amount of ligands were investigated. All derivative resins were characterized by elemental analysis, thermogravimetry, FT-IR and FT-Raman spectroscopy and ninhydrin test. The adsorption properties of the synthesized resins towards Pb(II), Cu(II), Cd(II), Zn(II), Ni(II), Co(II) and Cr(III) ions in aqueous solution were studied by batch method. The appropriate pH of all metal solutions was in the range of 5-7 for all resins. AEPE-PS-DVB and AEEE-PS-DVB showed the same sorption behavior. Their selectivity order was Pb(II)>Zn(II)>Cu(II)>Cd(II), Co(II), Ni(II), Cr(II). In addition, TETA-PS-DVB showed the selectivity towards only Pb(II) ion.

Field of study Petrochemistry and Polymer Science Student's signature Pradit
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LIST OF SYMBOLS AND ABBREVIATIONS

FAAS	Flame atomic absorption spectroscopy
EA	Elemental analysis
FTIR	Fourier transforms infrared spectroscopy
NMR	Nuclear magnetic resonance spectroscopy
ICP-OES	Inductively coupled plasma optically emission spectrometry
ICP-MS	Inductively coupled plasma mass spectrometry
SPE	Solid-phase extraction
LLE	Liquid-liquid extraction
PS-DVB	Polystyrene-divinylbenzene
AEEE	2-[2-(2-Amino-ethylsulfanyl)-ethylsulfanyl]-ethylamine
AEPE	2-[3-(2-Amino-ethylsulfanyl)-propylsulfanyl]-ethylamine
TETA	Triethylenetetramine
TGA	Thermogravimetric analysis