

**POLYELECTROLYTE-ENHANCED ULTRAFILTRATION (PEUF)  
FOR CHROMATE, SULPHATE, AND NITRATE IONS**

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A Thesis Submitted in Partial Fulfilment of the Requirements  
for the Degree of Master of Science  
The Petroleum and Petrochemical College, Chulalongkorn University  
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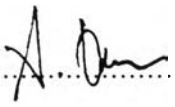
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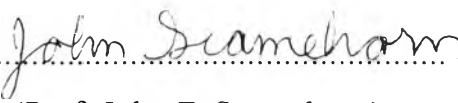
**Thesis Title** : Polyelectrolyte-Enhanced Ultrafiltration (PEUF) for  
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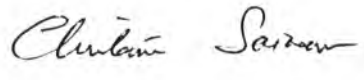
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Accepted by the Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Master of Science.

  
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## บทคัดย่อ

สุรเชษฐ์ ตั้งวิจิตรศรี : พอลิอิเล็กโตรไลต์เพิ่มการกรองแบบอัลตราฟิลเตรชัน (พี อี ยู เอฟ) เพื่อกำจัดไอออนโครเมต ซัลเฟต และไนเตรต ( Polyelectrolyte-Enhanced Ultrafiltration (PEUF) for Chromate Sulfate and Nitrate Ions) อ. ที่ปรึกษา : ศ. จอห์น เอฟ สเคมีฮอร์น (Prof. John F. Scamehorn), ผศ. จินตนา สายวรรณ : 96 หน้า ISBN 974-334-155-2

พอลิอิเล็กโตรไลต์เพิ่มการกรองแบบอัลตราฟิลเตรชัน (พี อี ยู เอฟ) เป็นเทคนิคการแยกแบบใช้เยื่อกรองที่ใช้กำจัดไอออนที่มีหลายประจุออกจากน้ำ ในการศึกษานี้ได้เติมพอลิอิเล็กโตรไลต์ที่ละลายน้ำ, พอลิไดอัลลิไควดเมทิลแอมโมเนียมคลอไรด์หรือควอทลงในสารละลายที่มีไอออนที่ต้องการกำจัดคือ ไอออนโครเมต ซัลเฟต และไนเตรต พอลิอิเล็กโตรไลต์จับกับไอออนเป้าหมายที่มีประจุตรงข้ามในสารละลายน้ำนั้น จากนั้นทำการกรองแบบอัลตราฟิลเตรชันผ่านเยื่อกรองซึ่งมีช่องผ่านเล็กเพียงพอที่จะจับสารเชิงซ้อนของพอลิอิเล็กโตรไลต์และไอออนไว้ได้ ผลการศึกษาพบว่า ค่าเปอร์เซ็นต์รีเจคชันเพิ่มขึ้นเมื่อเพิ่มอัตราส่วนความเข้มข้นของพอลิอิเล็กโตรไลต์ต่อไอออนประจุลบ ค่ารีเจคชันของประจุสองของไอออนโครเมตและซัลเฟตมีค่าสูงกว่าประจุหนึ่งของไอออนไนเตรต จากการศึกษาของ พี อี ยู เอฟ ชี้ให้เห็นว่าความเข้มข้นของพอลิอิเล็กโตรไลต์ในรีเทนเนตที่สูงไปลดค่าอัตราการไหลสัมพัทธ์ต่อเวลาลง เนื่องจากการสะสมของพอลิอิเล็กโตรไลต์ที่ละน้อยที่บริเวณผิวหน้าของเยื่อกรอง

## ABSTRACT

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KEYWORD: Ultrafiltration/ Chromate/ Sulphate/ Nitrate/ Polyelectrolyte-Enhanced Ultrafiltration

Surachet Tangvijitsri: Polyelectrolyte-Enhanced Ultrafiltration (PEUF) for Chromate, Sulphate, and Nitrate Ions. Thesis Advisors: Prof. John F. Scamehorn and Asst. Prof. Chintana Saiwan 96 pp  
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Polyelectrolyte-enhanced ultrafiltration (PEUF) is a membrane-based separation technique which can be used to remove multivalent ions from water. In this study, a water soluble polyelectrolyte, poly(diallyldimethyl ammonium chloride) or QUAT was added to aqueous solutions containing the target ions,  $\text{CrO}_4^{2-}$ ,  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$  to be removed. The target ions were bound to oppositely charged polyelectrolytes in the aqueous stream, which was then passed through an ultrafiltration membrane with pore sizes small enough to reject the polyelectrolyte-target ions complexes. The efficiency of the target ions removal or the rejection percentage was determined in this work. The rejection percentages of anions increased with increase in the concentration ratio of QUAT to anions. The rejection percentages of the divalent, chromate and sulphate ions were higher than that of the monovalent nitrate ion. Further studies of PEUF indicated that high QUAT concentrations in retentate decreased the relative flux due to the gradually accumulation of polyelectrolyte (hydrodynamic boundary layer) near the membrane surface.

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