

**REMOVAL OF HEAVY METALS FROM WASTEWATER MODEL
BY USING POLYBENZOXAZINE-BASED AEROGEL AS A POLYMERIC
LIGAND EXCHANGER**



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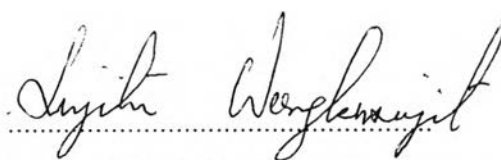
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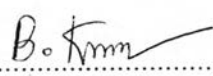

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ABSTRACT

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Heavy metals are commonly associated with water pollution; therefore, the removal of heavy metals from wastewater has become a necessity. Polymeric ligand exchangers (PLE) are a class of promising sorbents that absorb chemicals based on their ligand characteristics rather than ionic charges. In the present study, polybenzoxazine based aerogel is chosen as the polymeric ligand exchanger. Nitrogen donor atoms in polybenzoxazine molecule are used as metal hosting sites. The removal of metal ions is in the following order: $\text{Sn}^{2+} > \text{Cu}^{2+} > \text{Fe}^{2+} > \text{Pb}^{2+} > \text{Ni}^{2+} > \text{Cd}^{2+} > \text{Cr}^{2+}$; which is in accordance with the Irving-Williams rule. Additionally, the efficiency of the metal ion removal depends on the amount of absorbents and absorption time while the desorption process is a function of pH, type of solution, and temperature.

บทคัดย่อ

ธิดารัตน์ โกมลวานิช : การกำจัดโลหะหนักจากน้ำเสียโดยใช้ออร์แกนิกแอโรเจลที่เตรียมจากพอลิเบนซอกซาซีน (Removal Heavy Metal from Wastewater Model by Using Polybenzoxazine-based aerogel as A Polymeric Ligand Exchanger) อ.ที่ปรึกษา : รองศาสตราจารย์ ดร.สุจิตรา วงศ์เกษมจิตต์ และ ดร. ธัญญลักษณ์ ฉายสุวรรณ 42 หน้า

โลหะหนักเป็นอีกหนึ่งปัจจัยที่ทำให้เกิดมลพิษทางน้ำ ดังนั้นการกำจัดโลหะหนักออกจากน้ำเสียจึงเป็นปัญหาที่โรงงานอุตสาหกรรมจำเป็นต้องแก้ไข วัตถุประสงค์ของงานนี้คือ การศึกษาการเตรียมออร์แกนิกแอโรเจลจากพอลิเบนซอกซาซีนเพื่อใช้เป็นลิแกนด์สำหรับจับโลหะหนักในน้ำเสีย จากการวิเคราะห์ผลการทดลองพบว่า แนวโน้มความสามารถในการจับโลหะหนักของแอโรเจลที่เตรียมได้เป็นไปตามลำดับดังนี้ ดีบุก > ทองแดง > เหล็ก > ตะกั่ว > นิกเกิล > แคดเมียม > โครเมียม โดยที่โลหะหนักดังกล่าวเป็นไอออนที่มีประจุเท่ากับสองบวก การเกิดพันธะระหว่างแอโรเจลกับไอออนของโลหะในสารละลายที่ผสมเป็นเนื้อเดียวกันสามารถอธิบายโดยใช้กฎของเฮร์วิงและวิลเลียม ยิ่งไปกว่านั้น เราพบว่า ค่าการดูดซับของโลหะหนักในสารละลายขึ้นอยู่กับปริมาณของแอโรเจลที่ใช้ในการดูดซับและเวลา สำหรับการนำแอโรเจลกลับมาใช้อีกครั้ง โดยการกำจัดโลหะหนักที่ถูกดูดซับออกขึ้นอยู่กับสารละลาย ค่าความเป็นกรดต่าง และอุณหภูมิ

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ABBREVIATIONS

PBZ	polybenzoxazine-based aerogel
PLE	polymeric ligand exchangers
COD	chemical oxygen demand
BOD	biological chemical demand
TOC	total organic carbon