

# FABRICATION OF NOVEL AZO-LINKAGE ION-EXCHANGE ADSORBENT BASED ON GREEN POLYMERS FOR NITRATE REMOVAL

## *DWFI-Supported Student Research*

Each year DWFI leverages Robert B. Daugherty Foundation funds and additional donor funds to support graduate and undergraduate student research and creative activity. Funds are matched one-to-one by their DWFI Faculty Fellow advisors. This year we had to cancel our annual research forum, scheduled for April 2, and missed seeing the students present their work in person.

To celebrate the incredible research being done, students have shared a brief summary of their work and its impact. We're excited to share their work with you here. View more research from DWFI's supported students » <http://dwfi.us/Gx3150ze6F5>

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**Student:** Elham Tavakoli, for a Ph.D. in Chemical & Biomolecular Engineering

**Advisor:** Siamak Nejati, Assistant Professor, Chemical & Biomolecular Engineering, University of Nebraska–Lincoln

## **WHAT?**

Nitrogen-containing fertilizers play a crucial role both in the crop yield and quality. The nitrogen-containing compounds convert to nitrates in the soil. Thus, the excess amount of nitrogen in the soil can result in high nitrate accumulation in plants, especially in most vegetables, or may lead to ground and surface water contamination through nitrate leaching and soil erosion. The high concentration of nitrate in our water supply can cause potential risks to human health.

## **SO WHAT?**

To address nitrate contamination in water resources, we developed a practical approach to synthesize ion-exchange materials. In this work, we aimed to meet the institute's mission by developing new materials that allow for preserving our water resources. To enhance the processability and performance of adsorbent, we designed novel chemistry to synthesize adsorbent beads by employing the emulsion polymerization method. To do so, we worked on the design, synthesis, and purification of a novel azo-based divinyl-crosslinker. The synthesized azobenzene crosslinker can act not only as the active site, and nitrate scavenge for nitrate, but also, it provides a coordination capability with transition metal modifier to improve the final performance of adsorbents.

## **NOW WHAT?**

The next phase of this project will focus on the adjustment of the emulsion polymerization technique to prepare micron-size adsorbent beads to boost the effective surface area. Afterward, we will design an efficient column, packing, operating parameters, and regenerating process to interact with nitrate ions and adsorb them from the water stream. By applying higher effective surface area, coordination of transition metal modifier, and optimized nitrate removal operational parameters, we will expect that our method reveals a new adsorbent with higher efficiency and selectivity as well as a simple and practical approach to clean water resources.