



UNIVERSITY OF
SASKATCHEWAN

Addressing Water Security by Controlled Uptake of Sulfate Using Tailored Chitosan-based Biosorbents



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Sulfate as contaminant

Worldwide issue

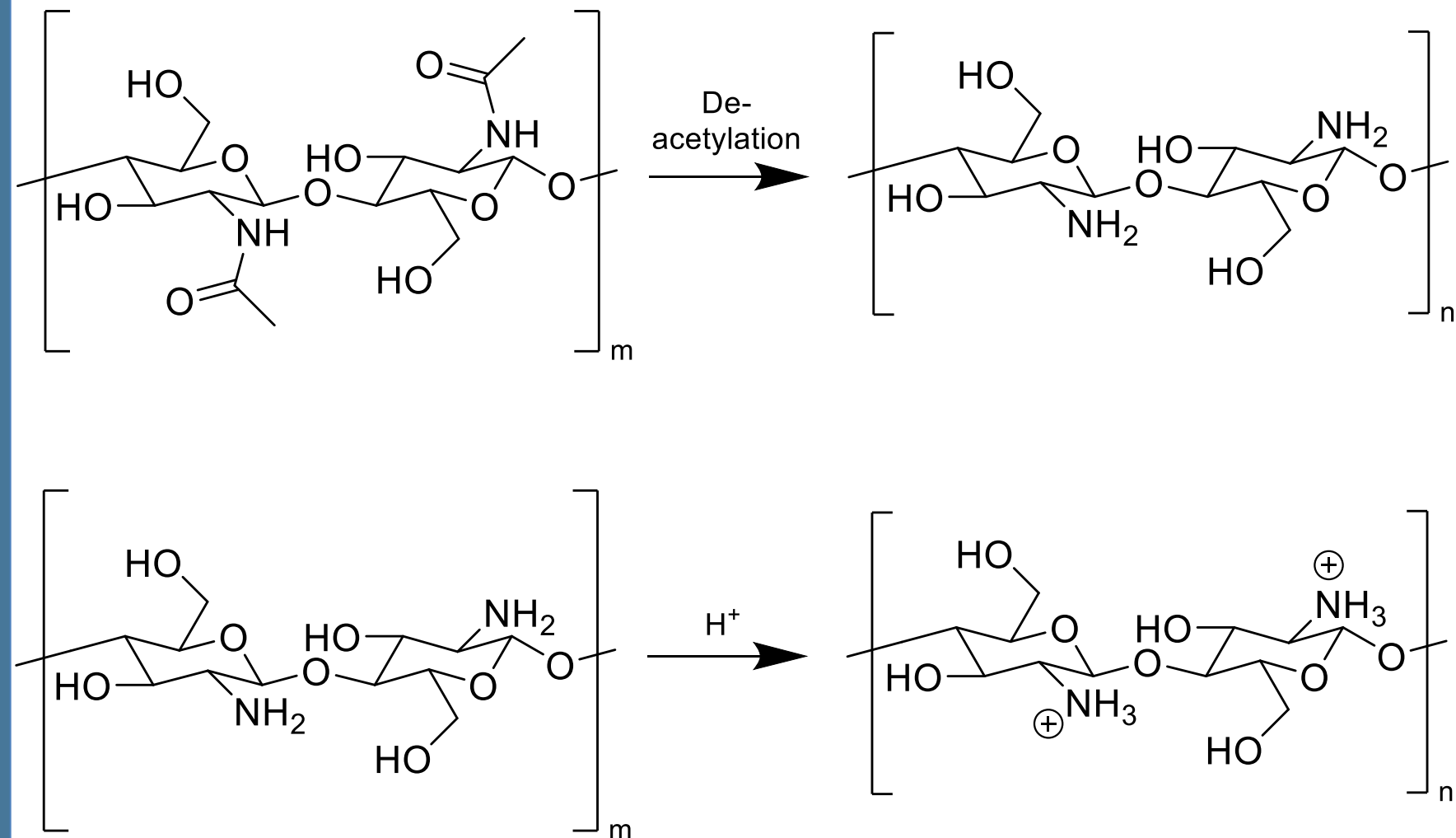
- Weathering
- Mining
- Discharge

- Contributes to water salinity
- Exacerbated by Global Warming
- Affects Agriculture
- Other effects on diverse ecosystems



Adsorption & Chitosan

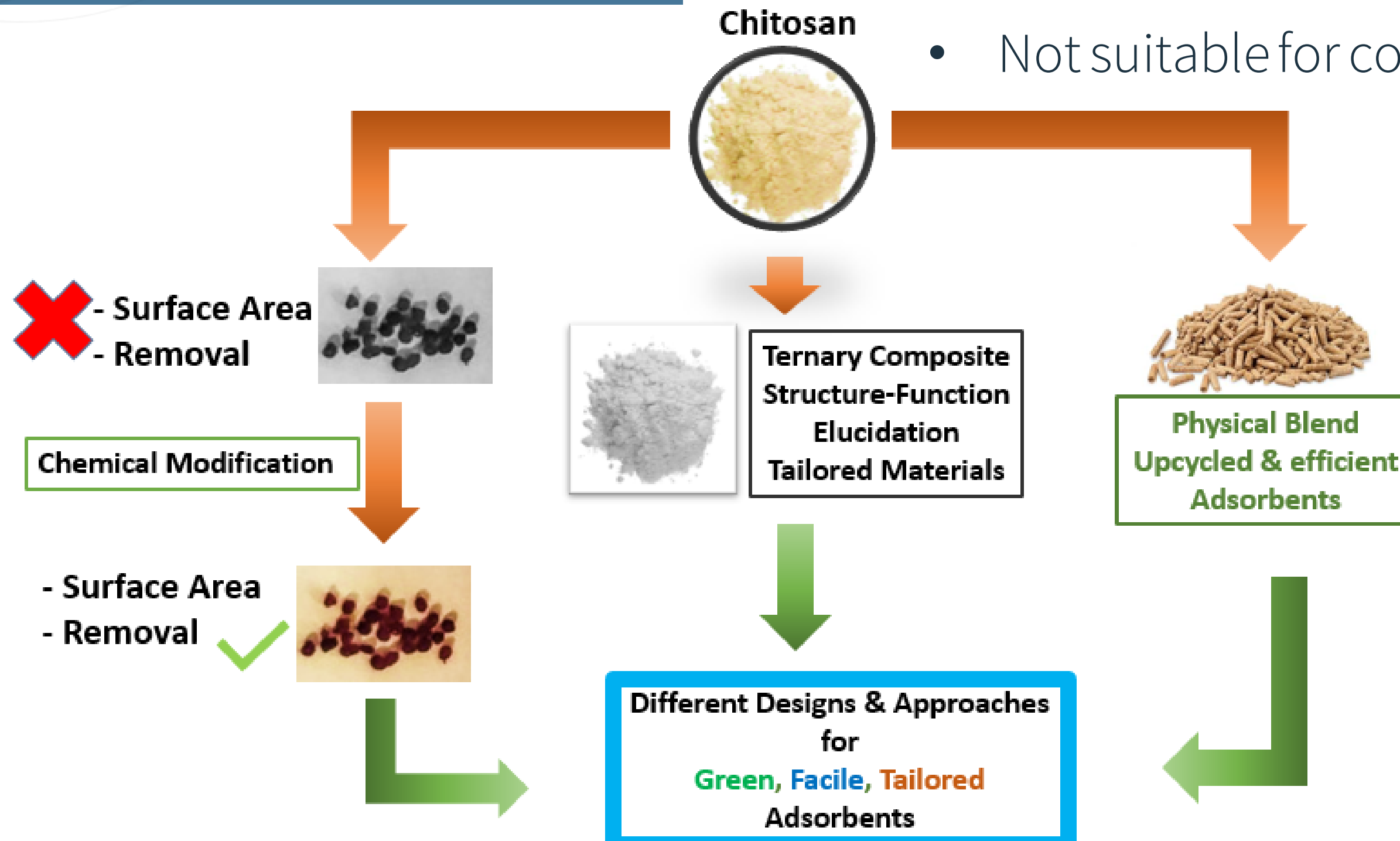
- Green & Sustainable
- Crustaceans & other Food Wastes
- Versatile and suitable material



Mitigation Strategies

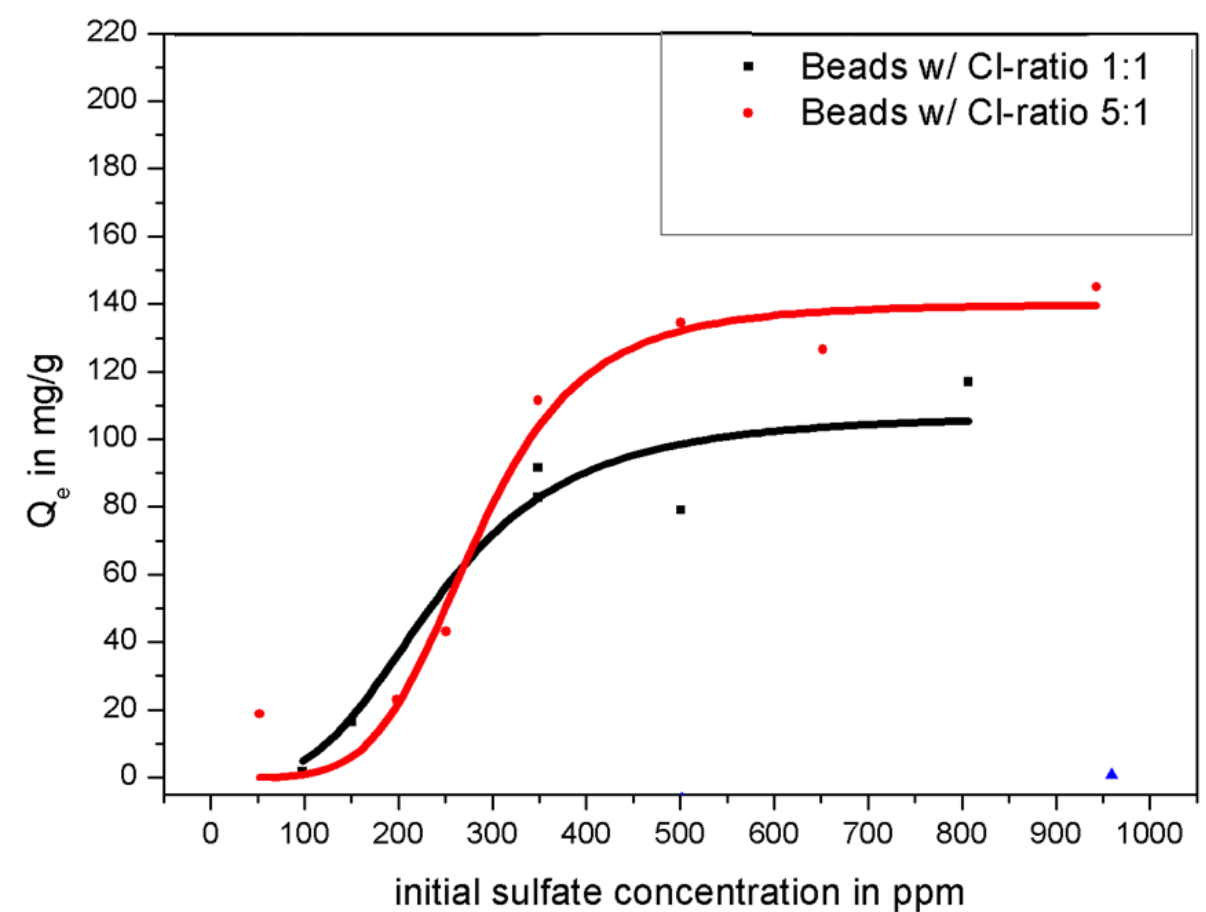
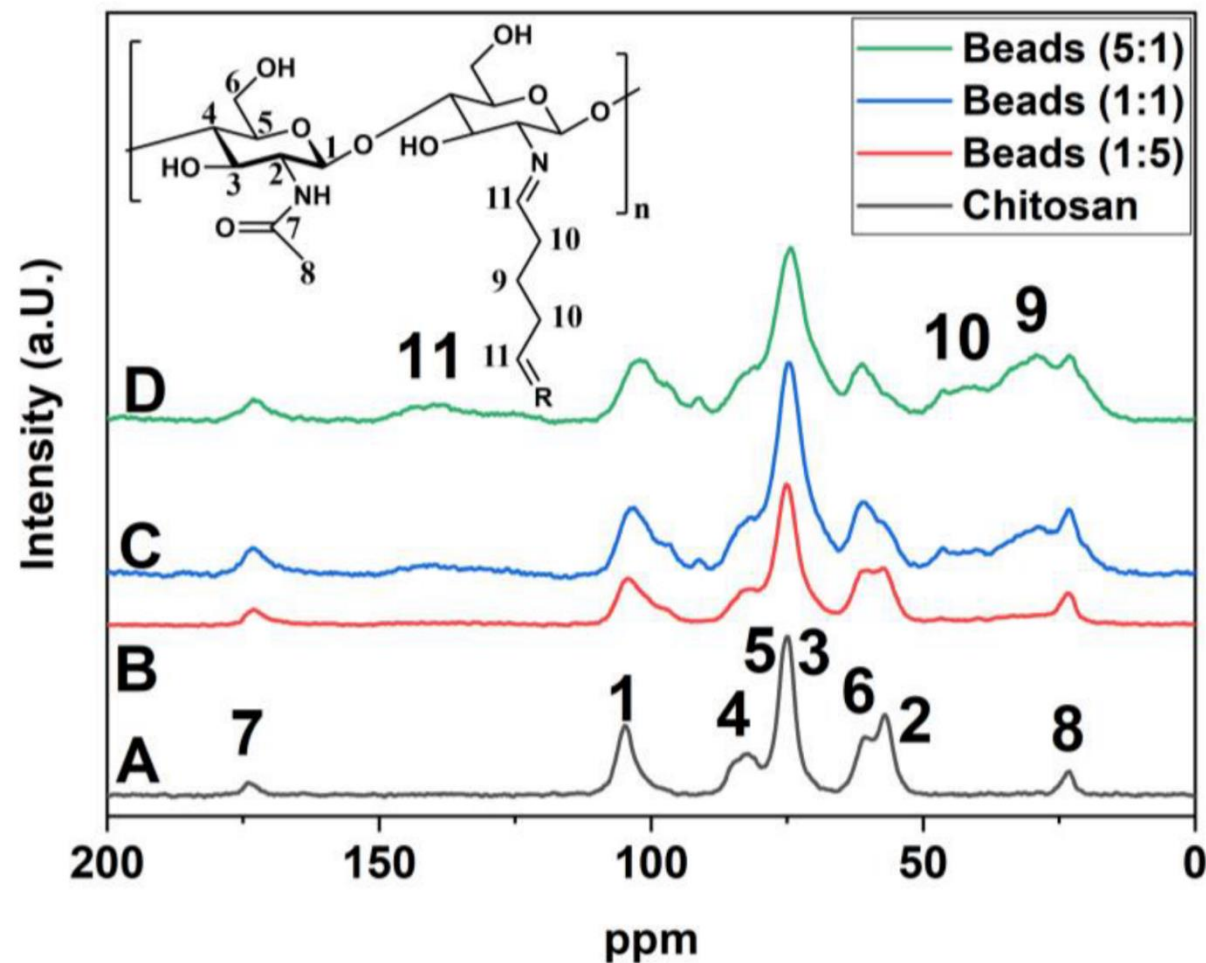
Overcoming inherent drawbacks of pristine Chitosan

- Low Surface Area
- Low Adsorption
- Not suitable for column application

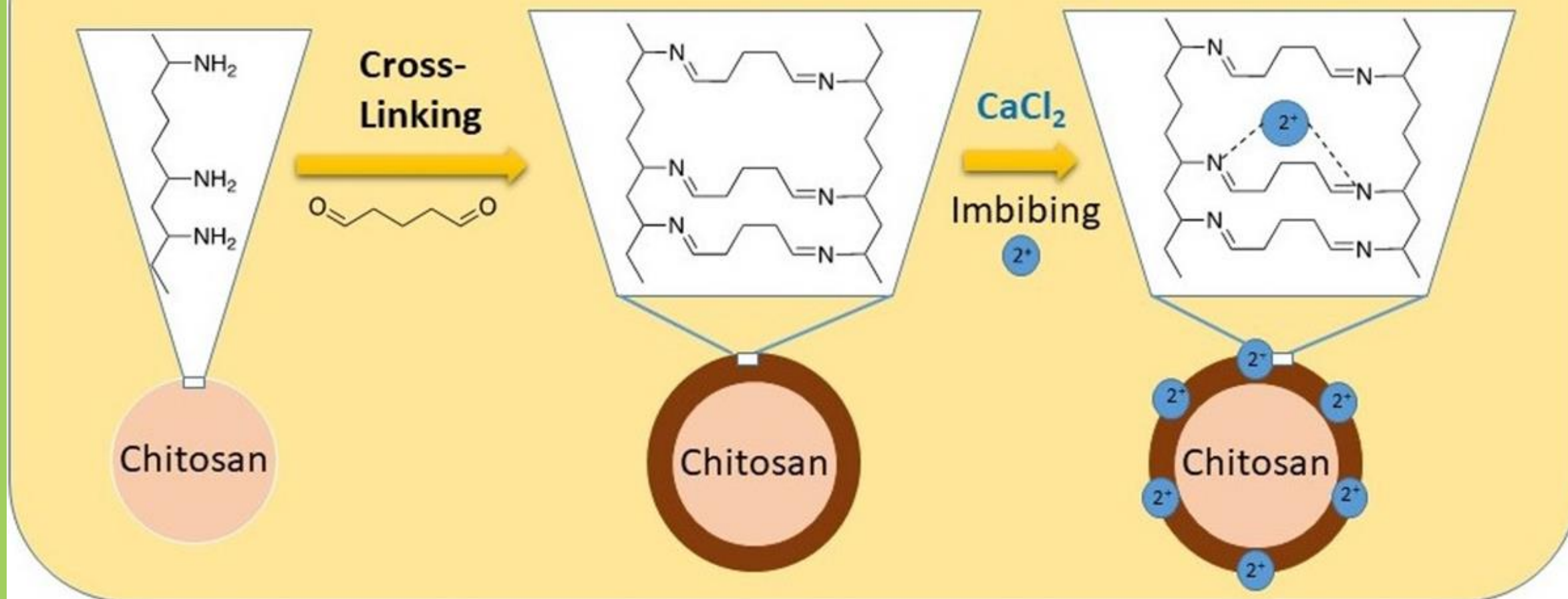


Chemical Modification

- Bead-based Materials suitable for Column Applications
- Even lower Surface Area accessible
- Modification mitigates Acid Instability & Adsorption Capacity

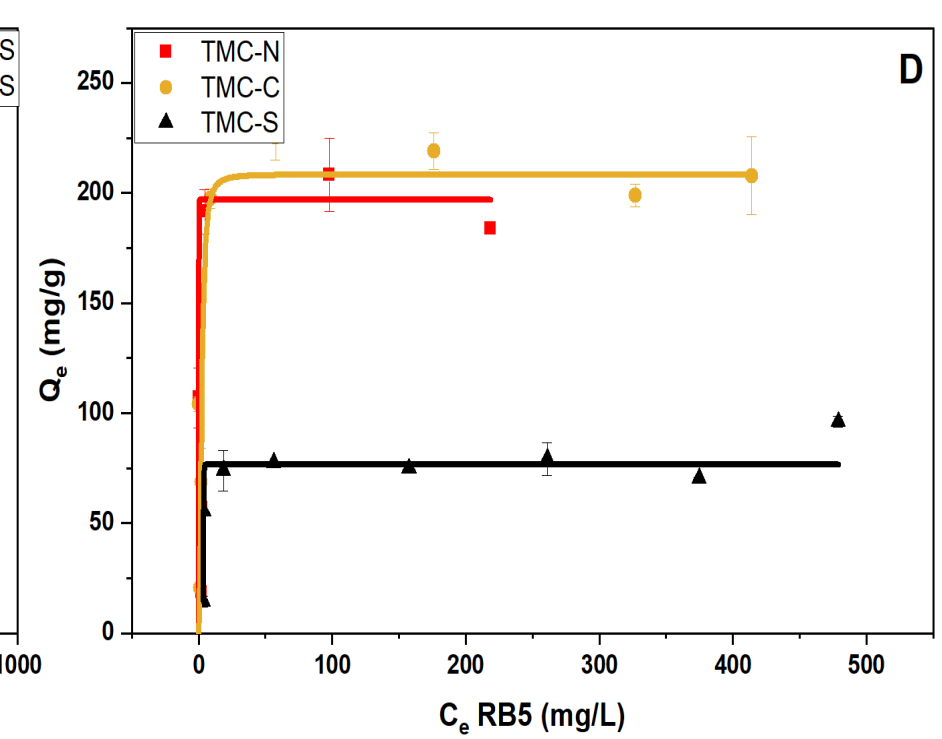
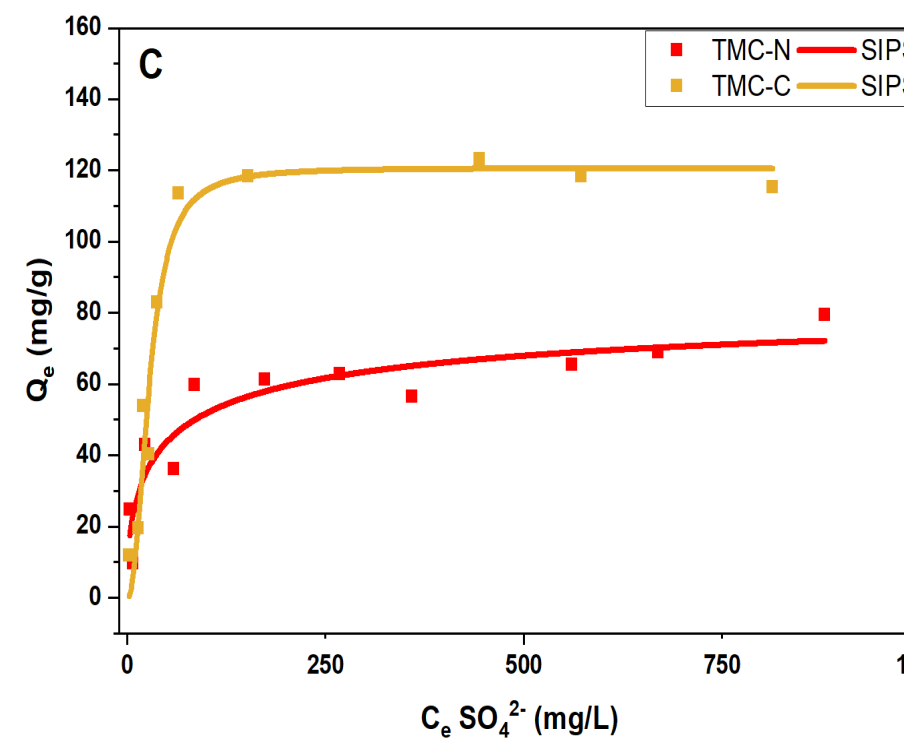
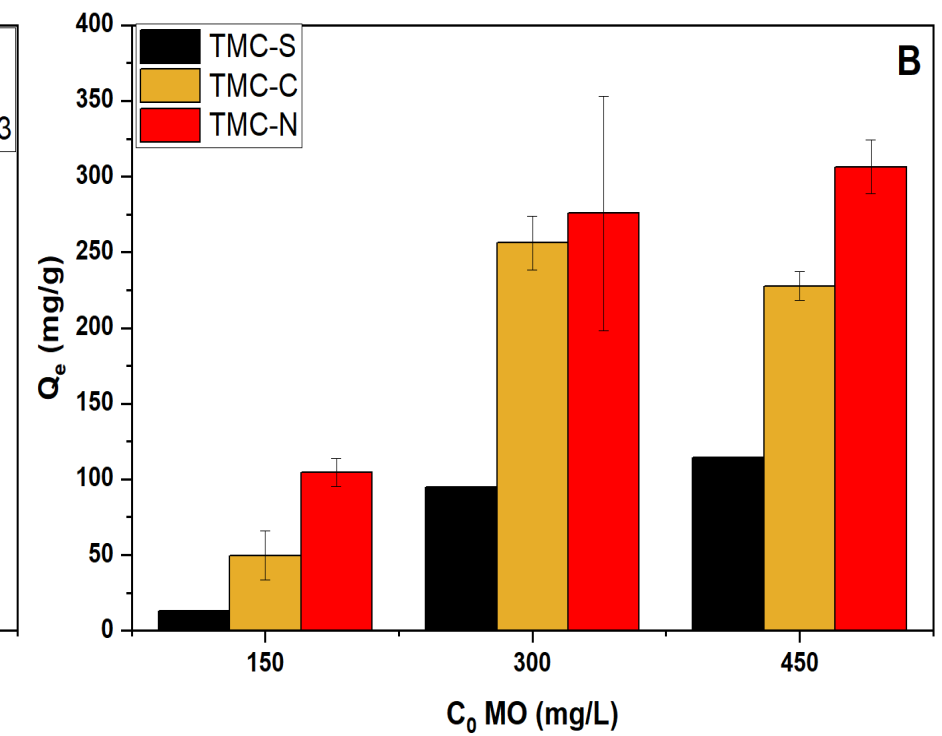
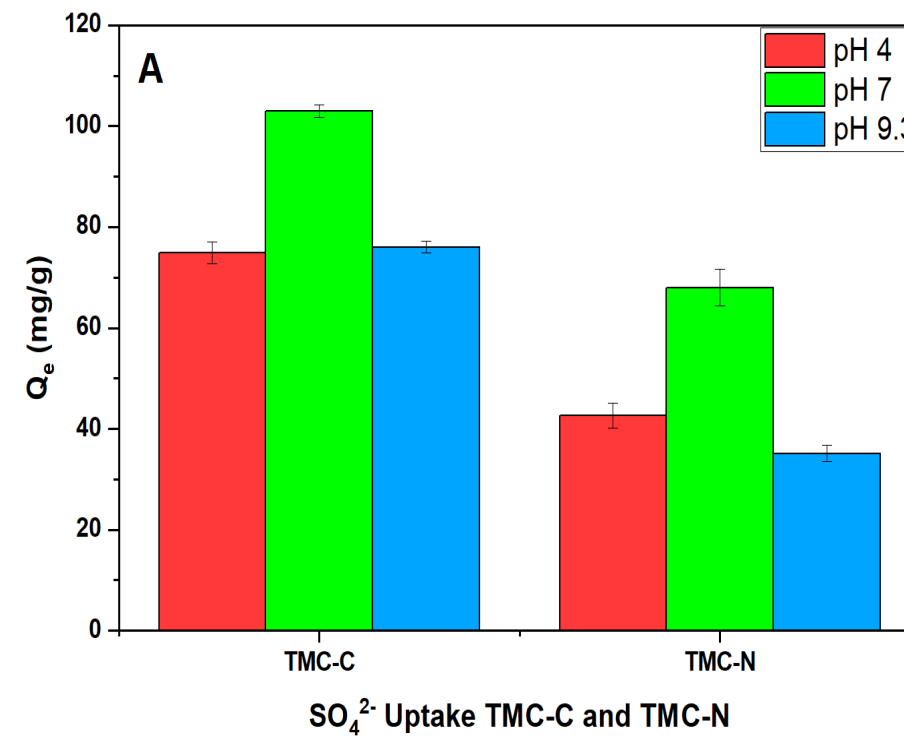


Modular Chitosan Beads as Tunable Sulfate Adsorbents



Ternary Metal Composites

- Three Components
- Alginate, Chitosan, Aluminium
- Counterion from Synthesis retained
- Counterion affects ion selectivity
- Material highly versatile
- Selectivity loosely based on Hofmeister Series
- Release of Chloride or Nitrate during Sulfate Adsorption



Outlook

- Utilize Green Chemistry Approach for Materials Design
- Avoid Hazardous Chemicals if possible
- Reduce amount of Chitosan to be cost effective
- Exploit Synergism between Materials
- Incorporate locally sourced Waste Materials

Thank you!

10

G I W S

YEARS
2011-2021

