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Nanostructured Polymer Adsorbents Synthesized via Inverse Pickering Emulsion Polymerization Technology for Heavy Metal Ion Removal from Wastewaters

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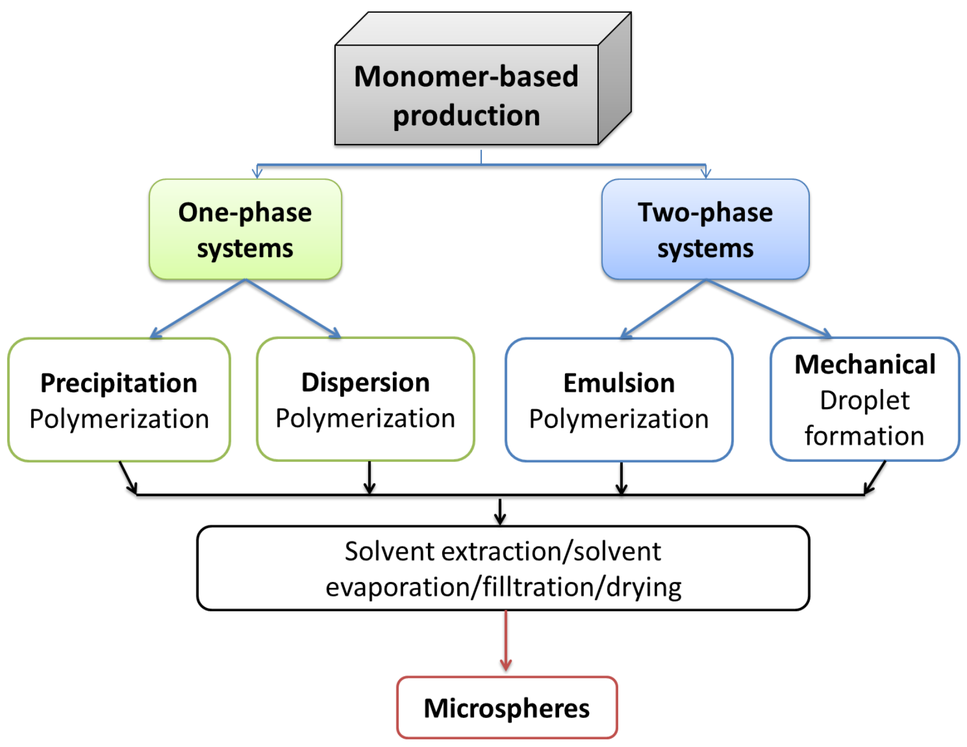
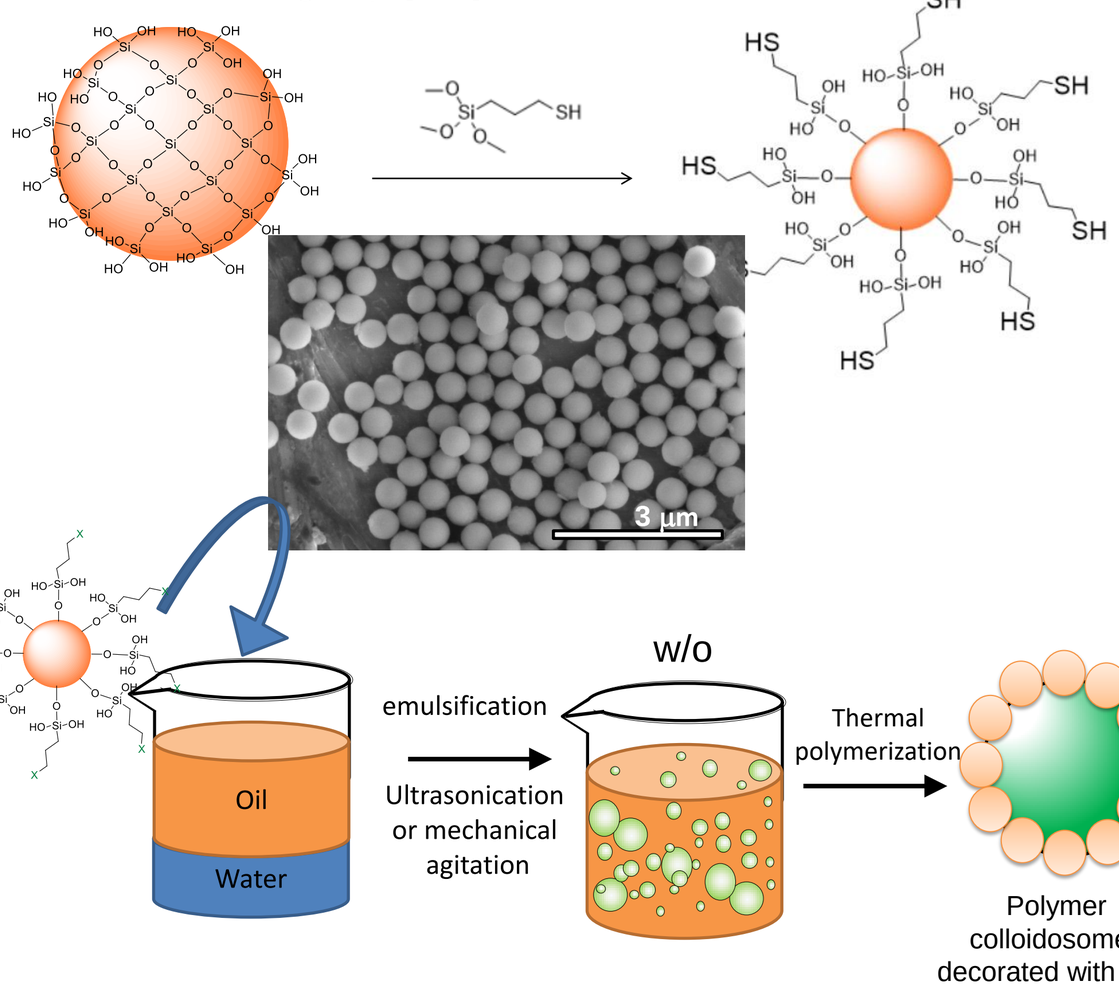
INTRODUCTION & AIM

- ✓ Environmental pollution, especially of water sources with heavy metal ions, is a global concern, and the removal of these contaminants from wastewater remains a major challenge for researchers
- ✓ Polymeric microspheres are considered promising adsorbents due to: flexibility in design and possibility of chemical adjustment
- ✓ Conventional synthesis methods do not provide adequate control over: morphology, porosity and wetting properties
- ✓ A simplified method for the synthesis of polymeric microspheres is proposed using: Pickering emulsion polymerization technology (PemPTech). The obtained microspheres are tested for their efficiency as adsorbents for the extraction and recovery of Cu(II) ions from water

METHOD



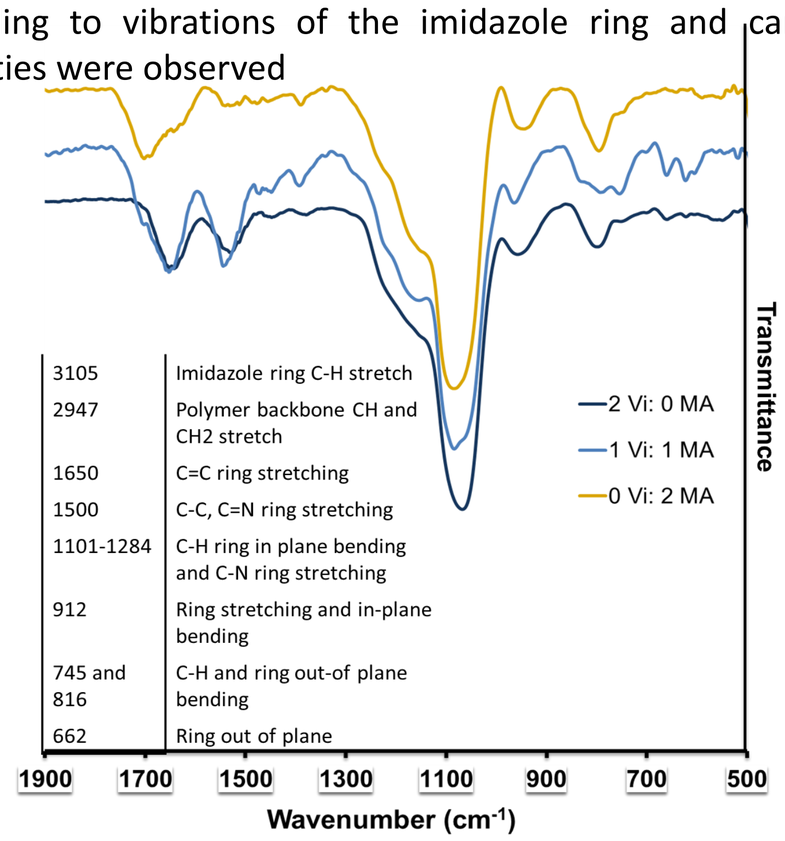
- ✓ Polymeric microspheres were obtained by polymerization of a water-in-oil (w/o) Pickering emulsion.
- ✓ In the initial stage, silica nanoparticles were synthesized and subsequently modified with thiol groups[1, 2].



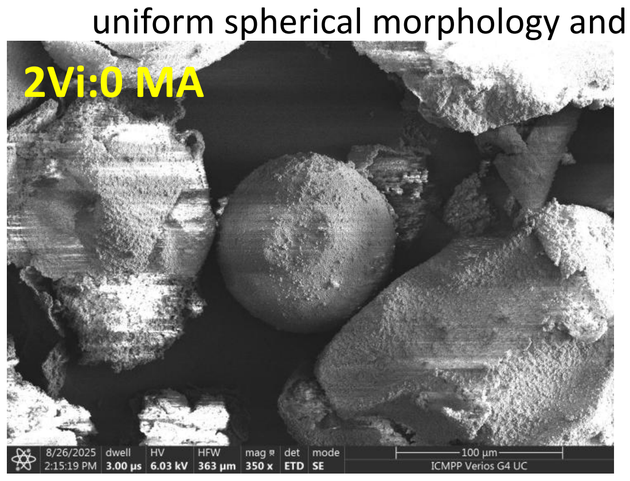
- ✓ To develop the polymeric system, an aqueous phase was employed, consisting of water and water-soluble monomers such as vinyl imidazole and methacrylic acid.

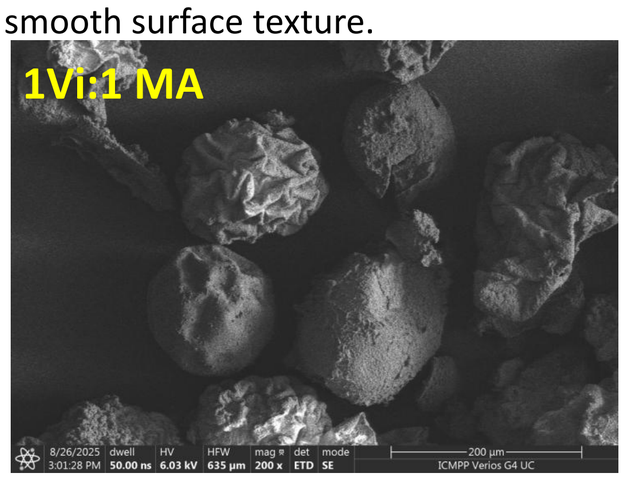
RESULTS & DISCUSSION

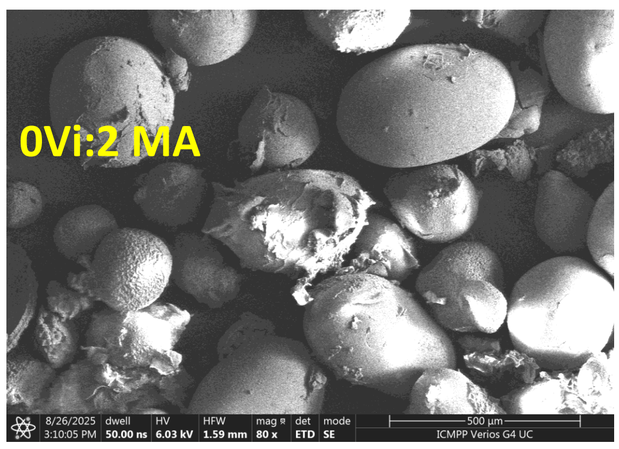
- ✓ FTIR analysis confirmed the presence of characteristic functional groups associated with both polyvinylimidazole and polymethacrylic acid blocks, indicating successful copolymerization. Key absorption bands corresponding to vibrations of the imidazole ring and carboxylic acid functionalities were observed

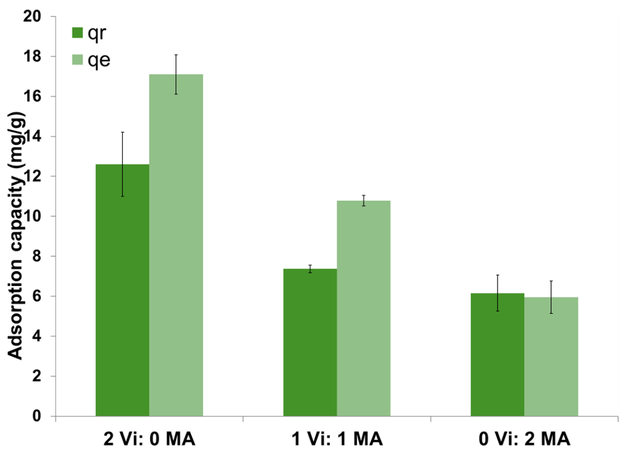


- ✓ SEM images of microspheres immediately after synthesis, showing uniform spherical morphology and smooth surface texture.









- ✓ Histogram illustrating recovery (green bars) and extraction (gray bars) capacities for Cu(II) ions from water of microspheres prepared via PEmPTech with varying ratio of the vinylimidazole-methacrylic acid monomers. Error bars indicate standard deviation from five independent experiments.

CONCLUSION

- ✓ The study demonstrates the versatility of PEmPTech in tuning the adsorption capacity by adjusting the vinylimidazole-methacrylic acid ratio. The resulting adsorbents performed as well as or better than those obtained by alternative methods.

FUTURE WORK / REFERENCES

1. A. Honciuc, O.-I. Negru, Nanomaterials 2021, 11, 3200

2. A. Honciuc; O.-I. Negru, Nanomaterials 2023, 13, 1246.