UNSW AUSTRALIA

2013 Taste of Research Summer Scholarship Program

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Enhanced Removal of Organic Pollutants with Novel Adsorbent

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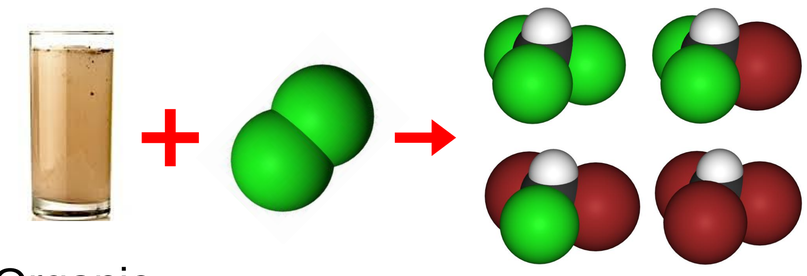
Resources and Infrastructure for the Future

Organic Pollutant in Water



Organic Pollutant (NOM) + Chlorine → Disinfection By-Products (Toxic)

Current Removal Methods

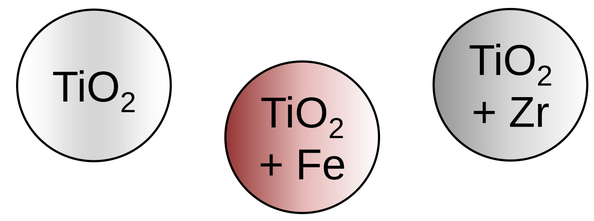
Coagulation - Ion Exchange Resin
Activated Carbon - Membrane Filtration

Waste Products

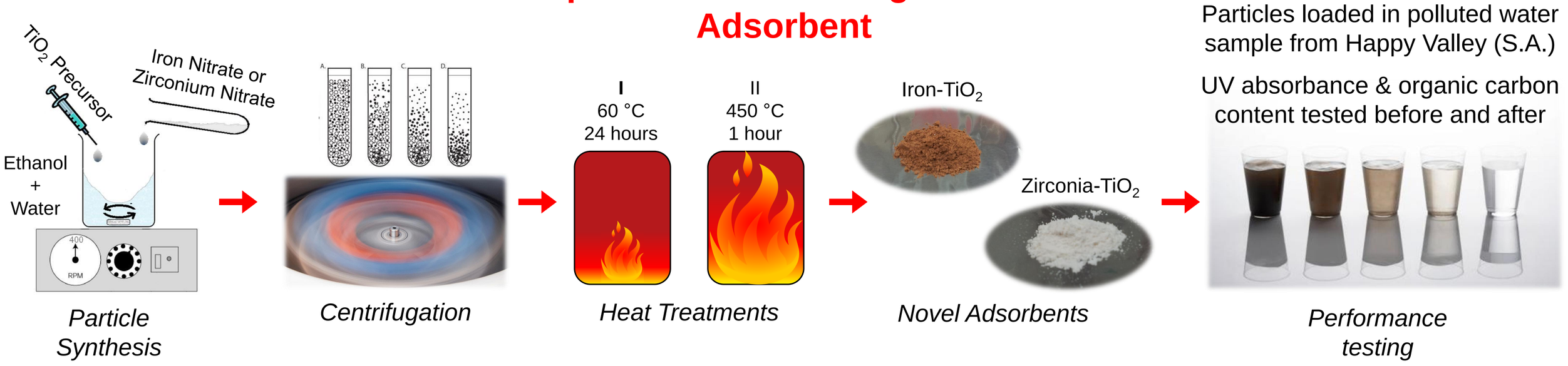
Energy Intensive

Novel Adsorbent

I synthesised metal oxide/ TiO_2 nanoparticles with the aim of enhancing the removal of NOM from drinking water



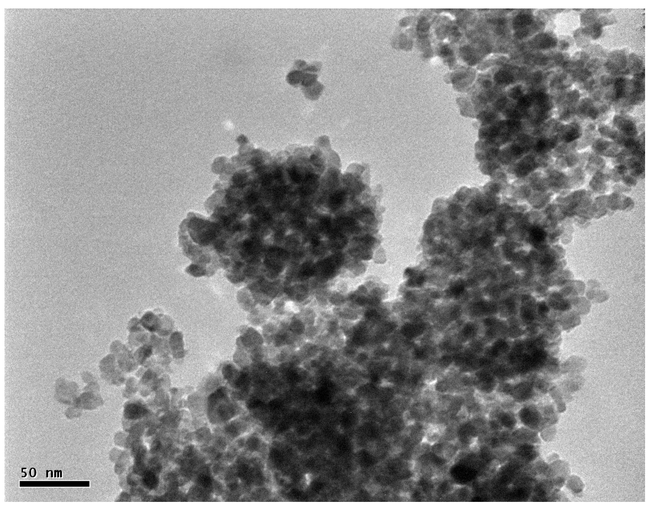
Preparation and Testing of Novel Adsorbent



Key Findings

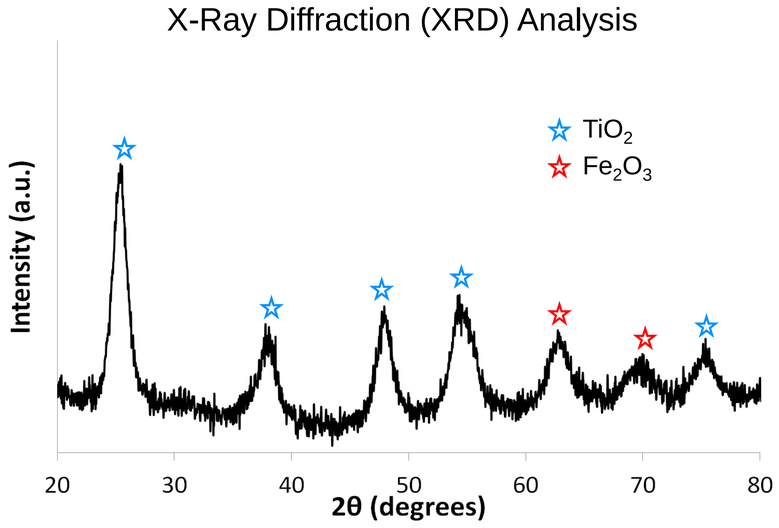
Nanoparticle Characterisation

Transmission Electron Microscopy (TEM)



Primary nanoparticle size of 10 nm

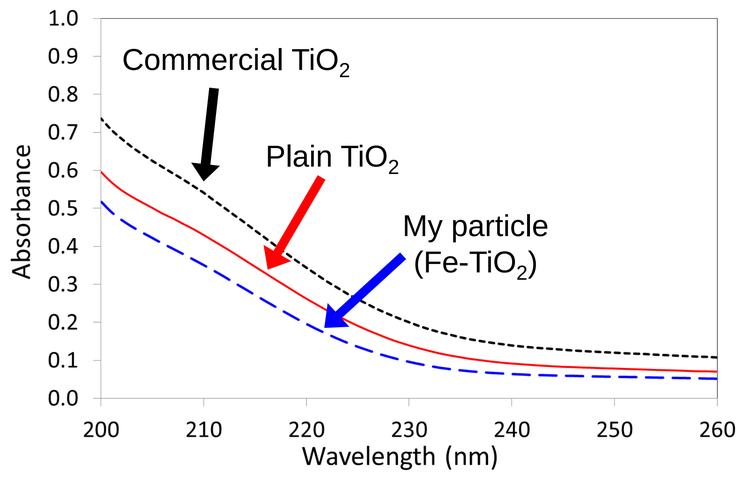
X-Ray Diffraction (XRD) Analysis



X-Ray Diffraction confirms TiO_2 and Fe_2O_3 mixed phase

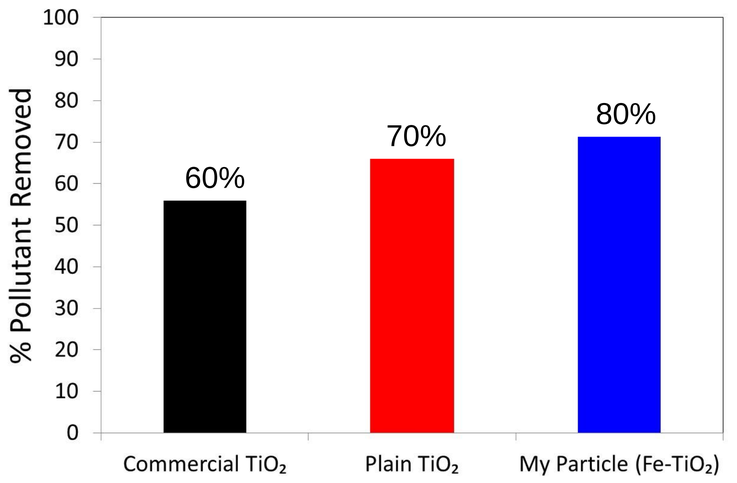
Removal performance

UV/Visible Spectrum Analysis



The lower absorbance of my particle shows its superior performance

Total Organic Carbon (TOC) Analysis



Increased pollutant removal efficiency of my particle

Results

Property	Commercial TiO_2	Plain TiO_2	My Particle (Fe-TiO_2)
BET Surface Area	35 - 65 m^2/g	96 m^2/g	125 m^2/g
Average Particle Size	21 nm	10 nm	15 nm

Increased surface area and smaller particle size supports performance results of my particles.

Conclusion

The removal performance tests showed that my synthesised TiO_2 and Fe-TiO_2 nanoparticles outperformed the commercial TiO_2 in adsorption tests, therefore enhancing the removal of NOM from drinking water.

Importance and Recommendations

- More effective treatment of organic pollutants
- Less waste and more energy efficiency
- Future studies might involve testing the degradation performance of my particles.

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Resources: Sigma-Aldrich: Titanium(IV) oxide specification sheet.