

Cost-effective eco-friendly synthesis of iron oxide nanoparticles from waste cans as a precursor for magnetic polymer fabrication

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Background



Generated by using AI



<https://www.shutterstock.com/search/rusted-tin-can>



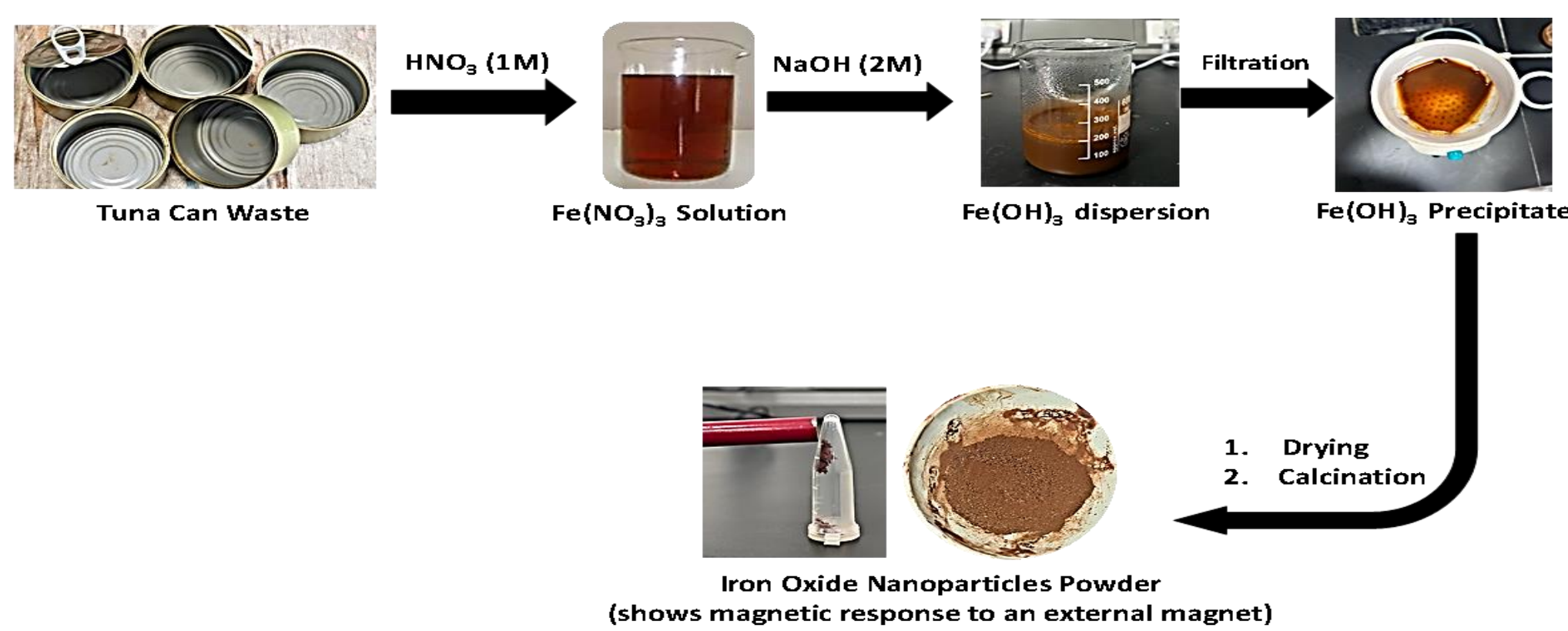
https://www.freepik.com/premium-photo/trash-can-tin-can-food-full-cans-white_4091690.htm

Problem !

"Cheap and widely used, tin cans are often discarded, creating environmental threats — but they hold great potential."

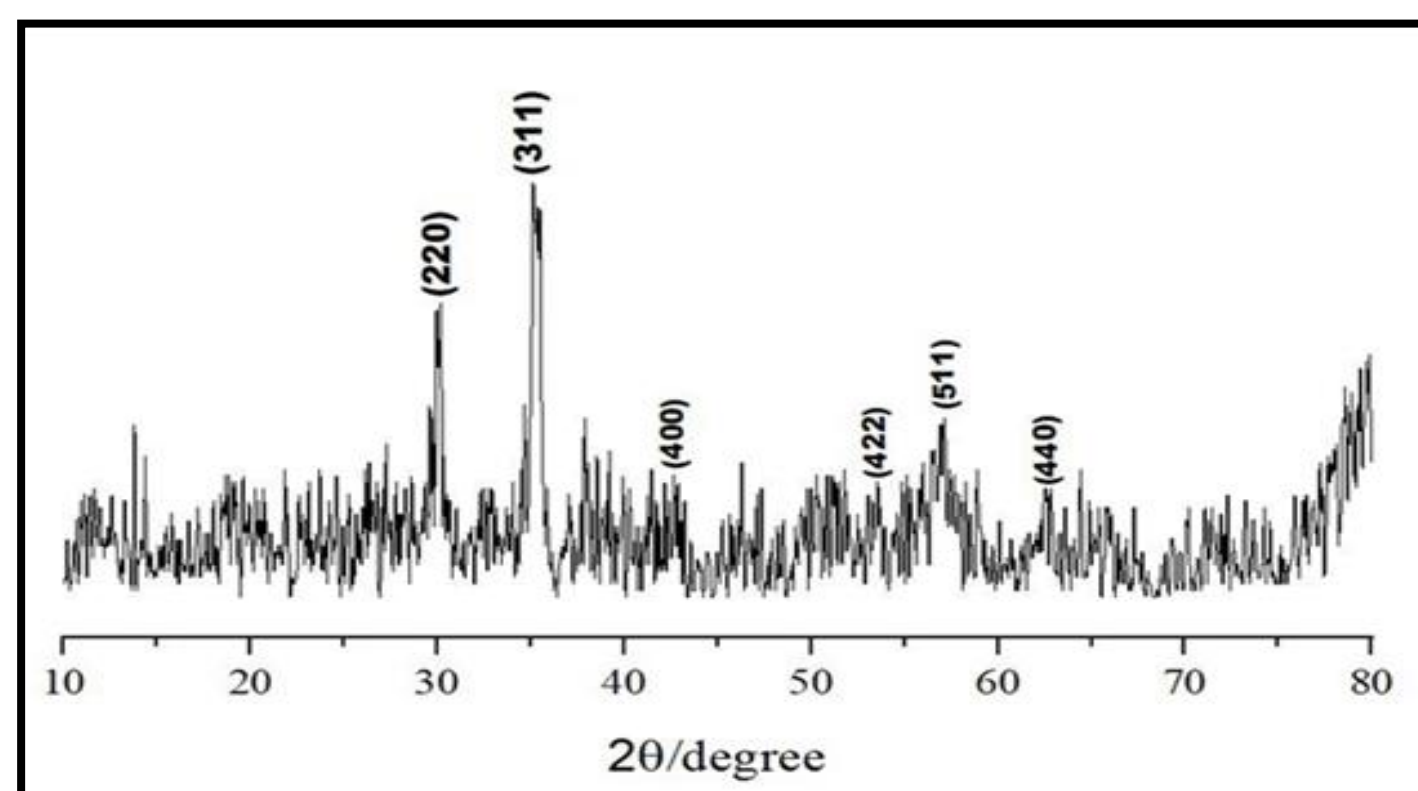
I. Preparation & Characterization Magnetite Nanoparticles

Preparation Scheme

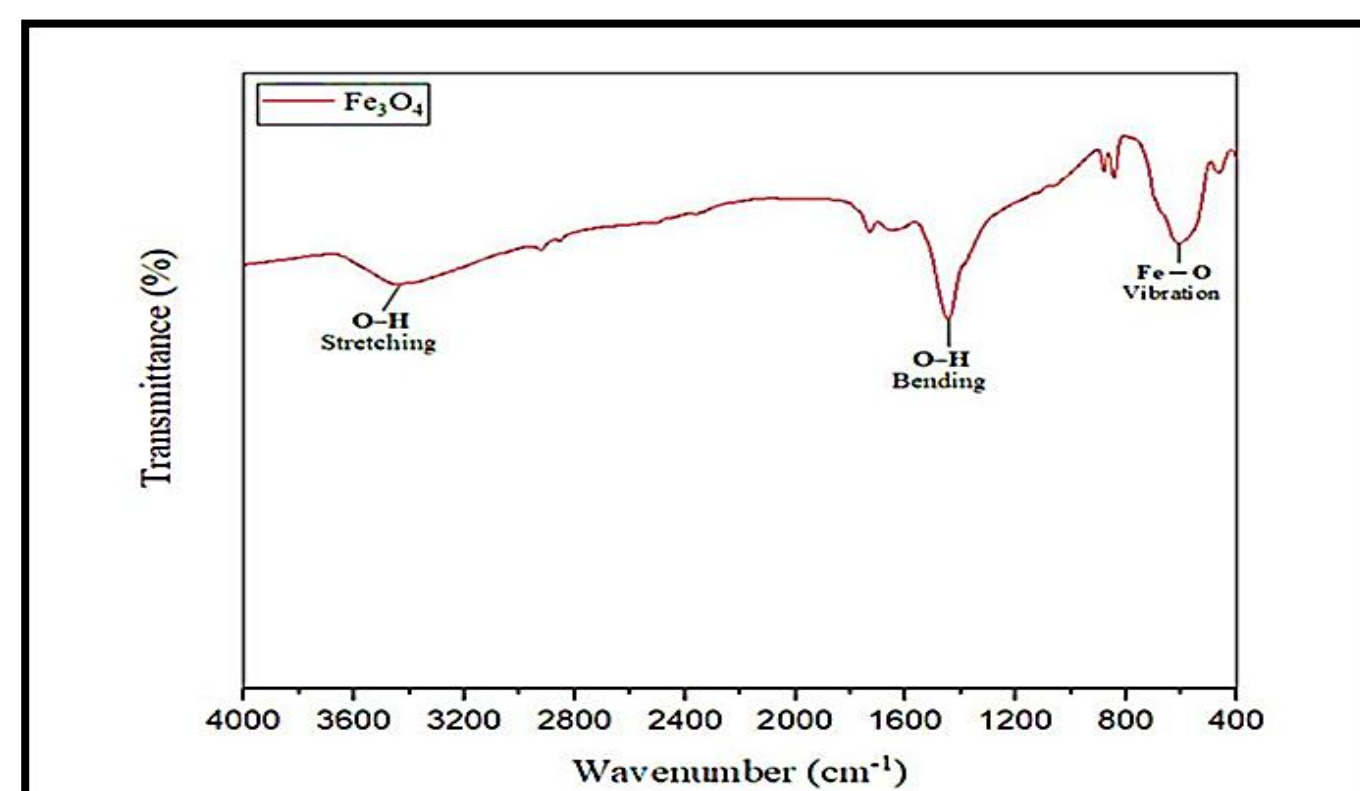


Characterizations

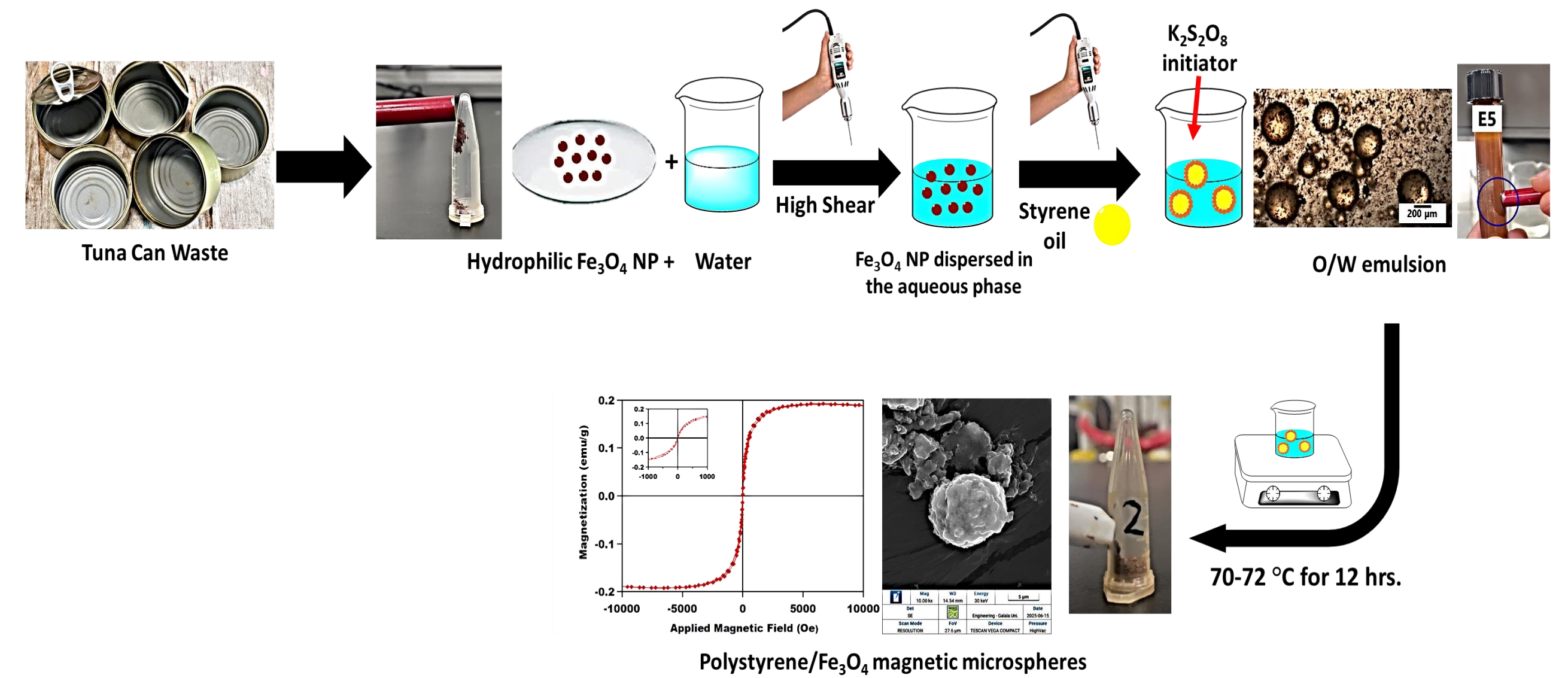
XRD



FTIR



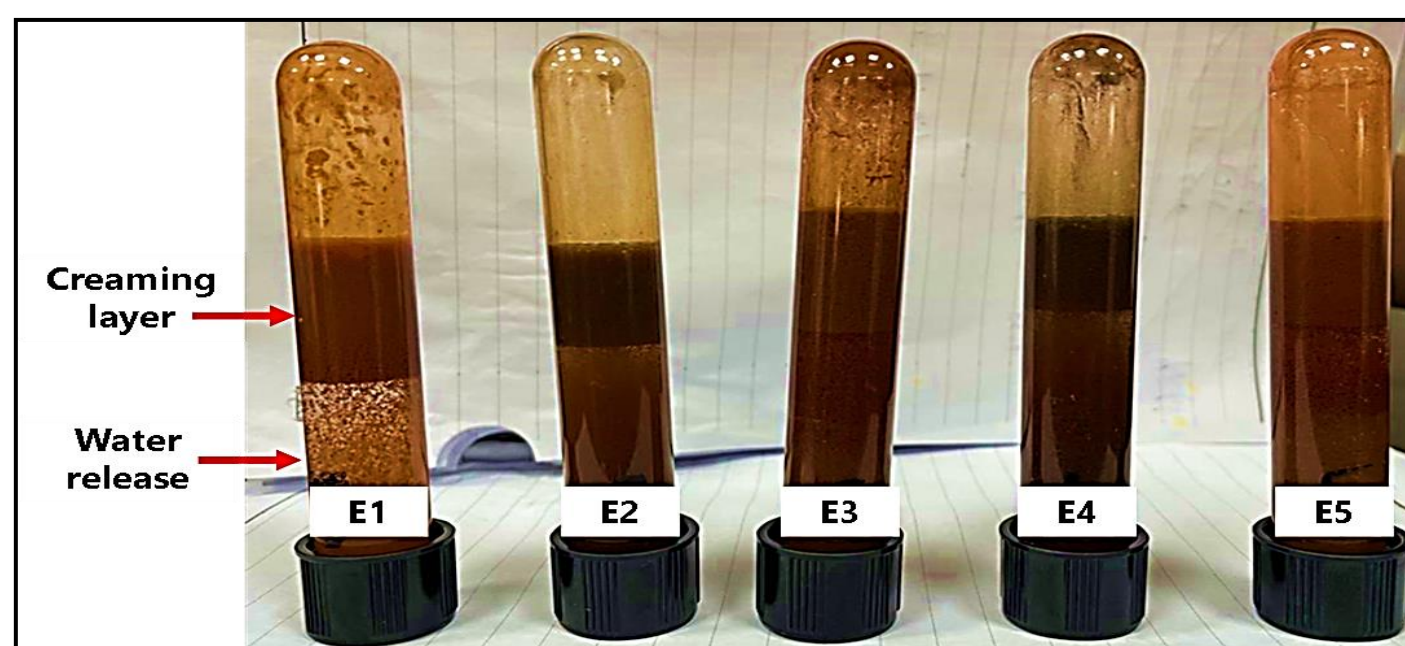
Aim of the work



II. Preparation of O/W Pickering Emulsion using Magnetite Nanoparticles as a Stabilizer

Characterizations

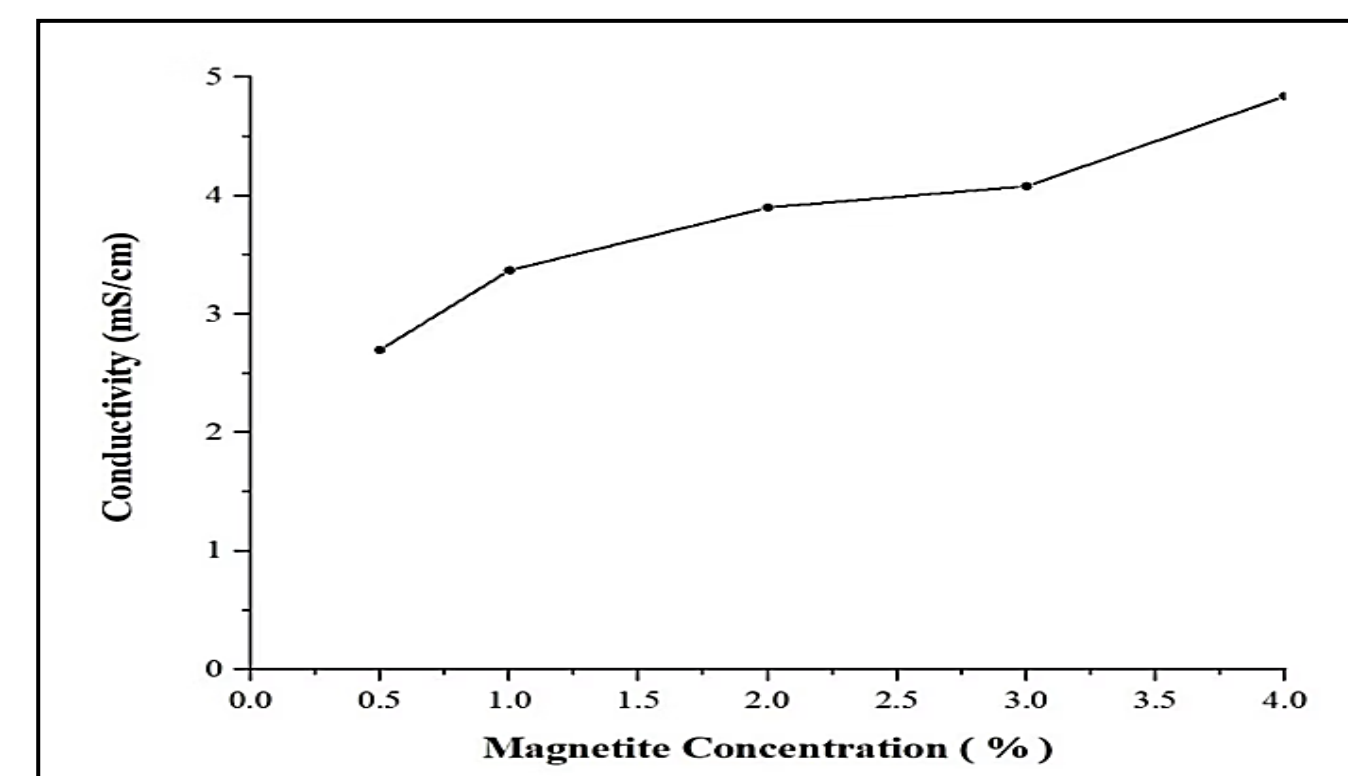
Creaming Layer



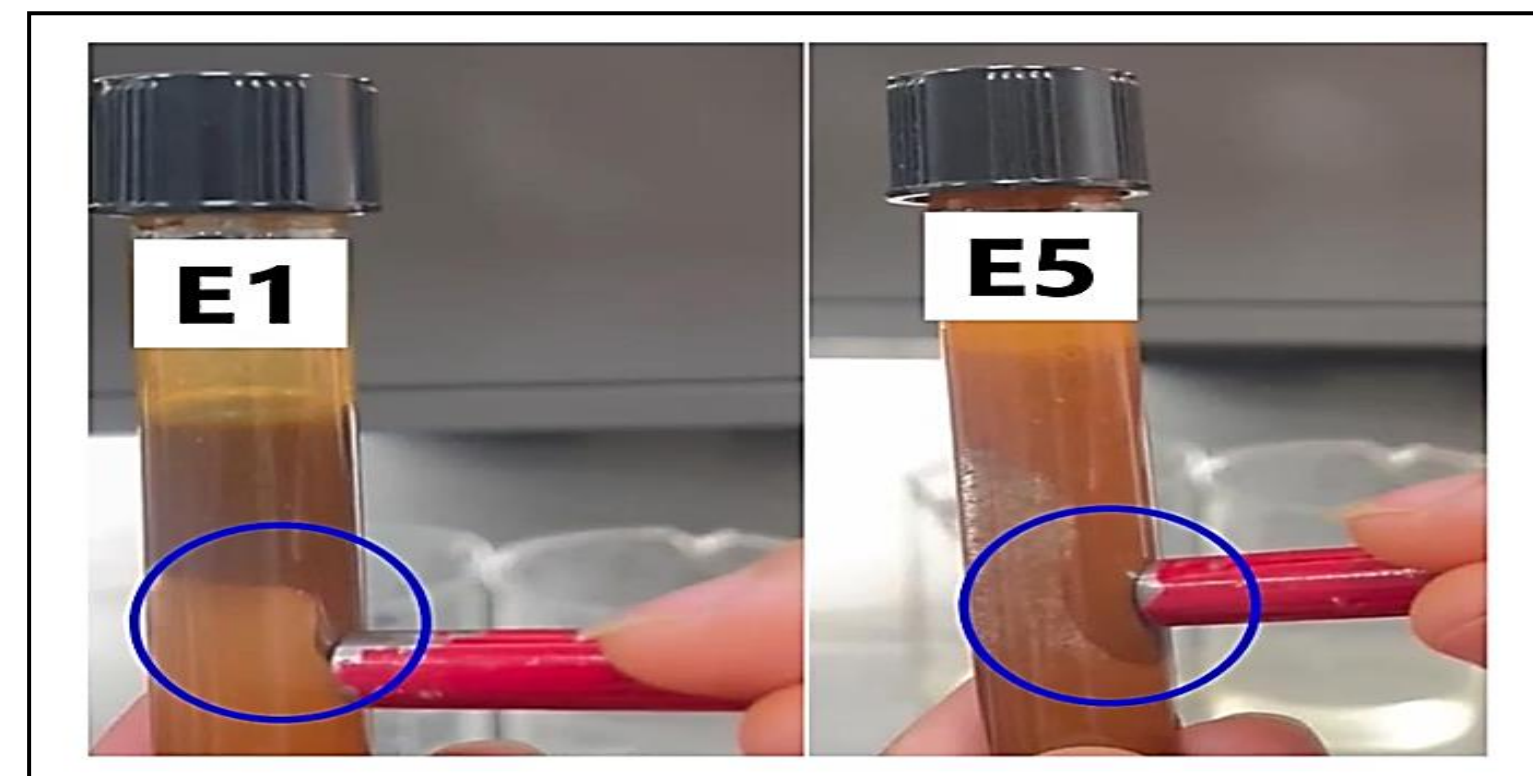
Emulsion Type Identification (Drop Test)



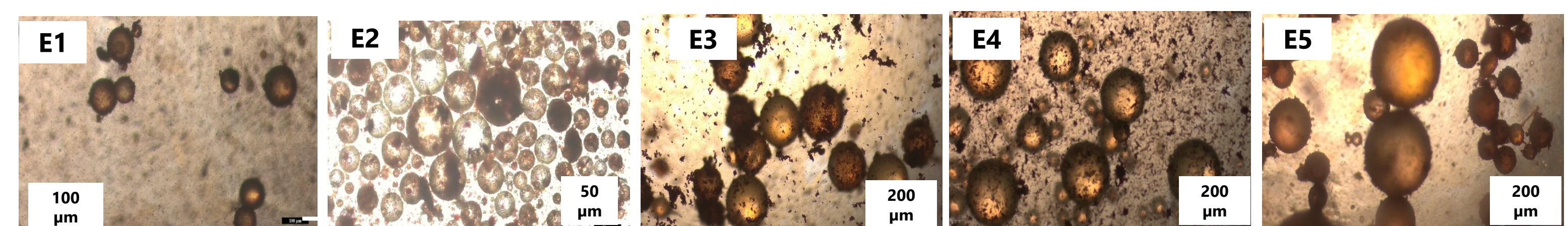
Conductivity Measurements



Magnetic Response Measurements



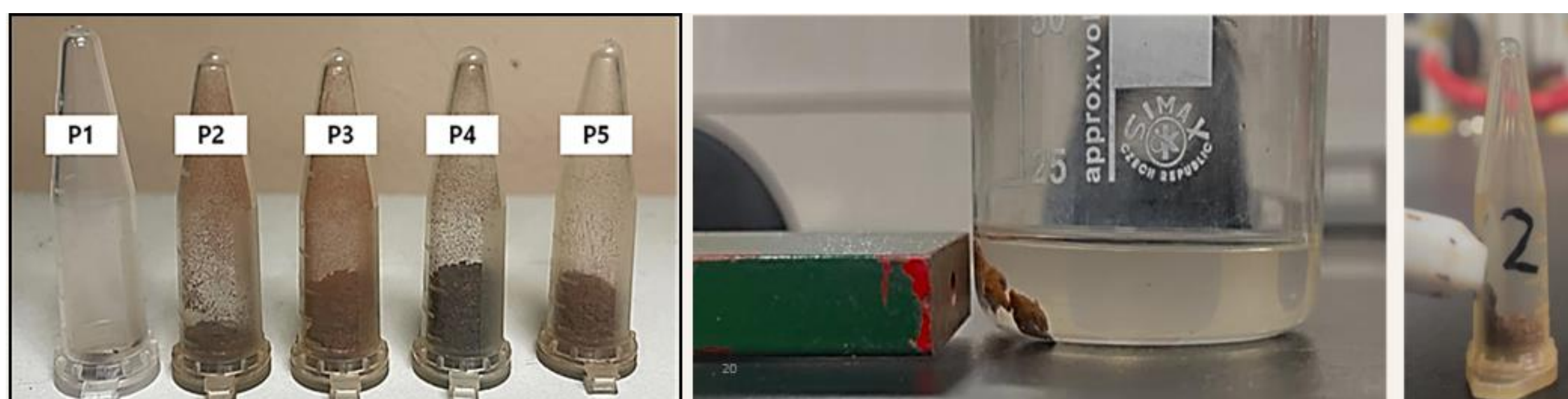
Emulsion Morphology and Droplet Size



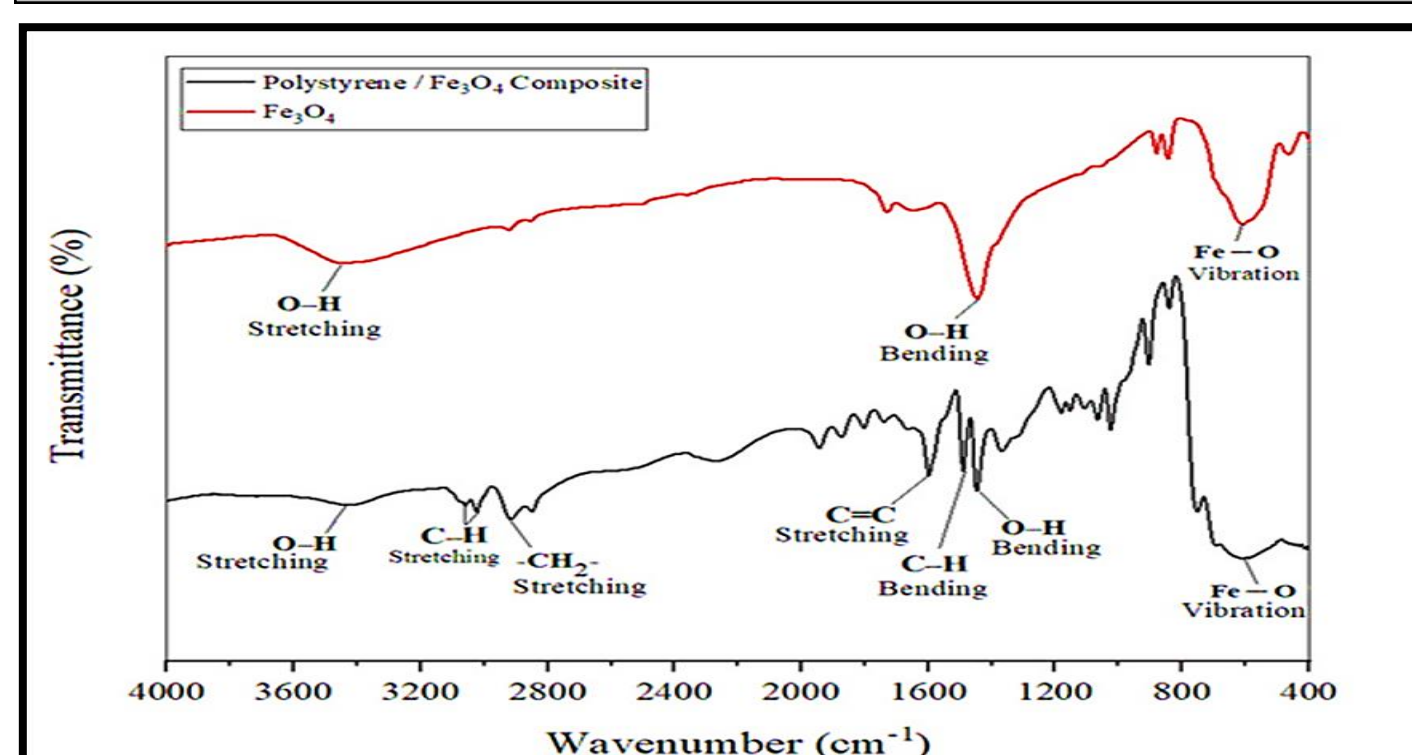
III. Fabrication of Magnetic Polymer

Sample No.	P ₁	P ₂	P ₃	P ₄	P ₅
Volume of oil, ml	2	2	2	2	2
Volume of water, ml	8	8	8	8	8
Iron oxide NP (wt %) based on water	0.5%	1%	2%	3%	4%
Wt. of iron oxide NP, g	0.04	0.08	0.16	0.24	0.32
Wt. of KPS (2%) based on water, g	0.16	0.16	0.16	0.16	0.16

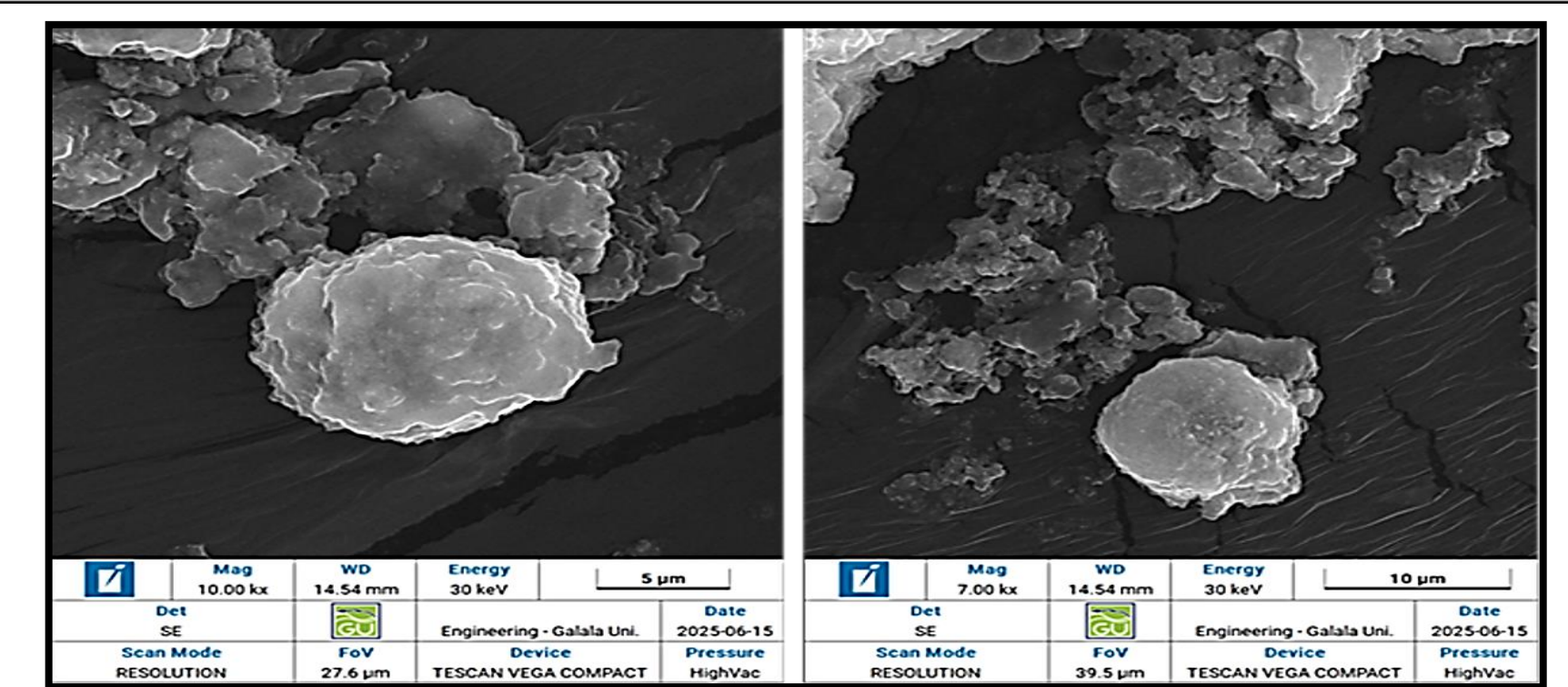
Heating and stirring emulsions in a water bath maintained at 70 °C for overnight, washing, filtration and drying in the oven for 2 hours.



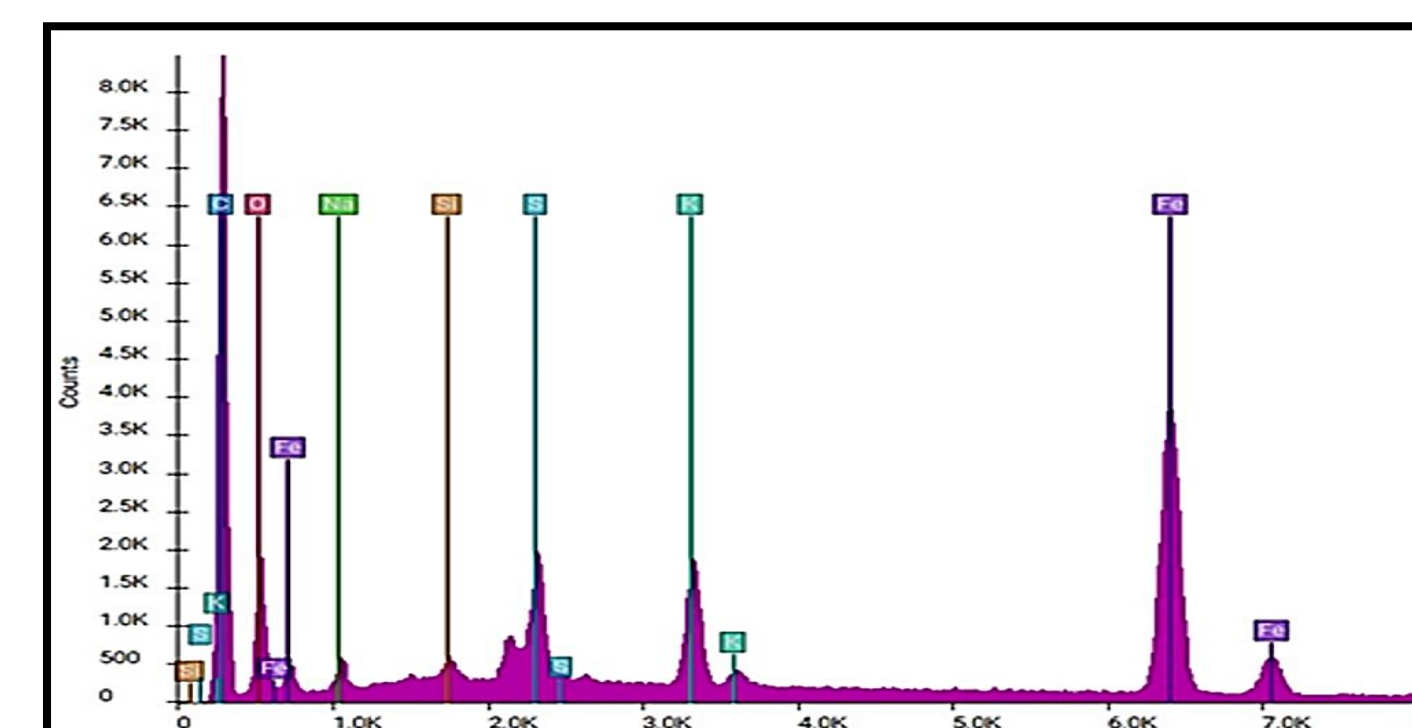
FTIR



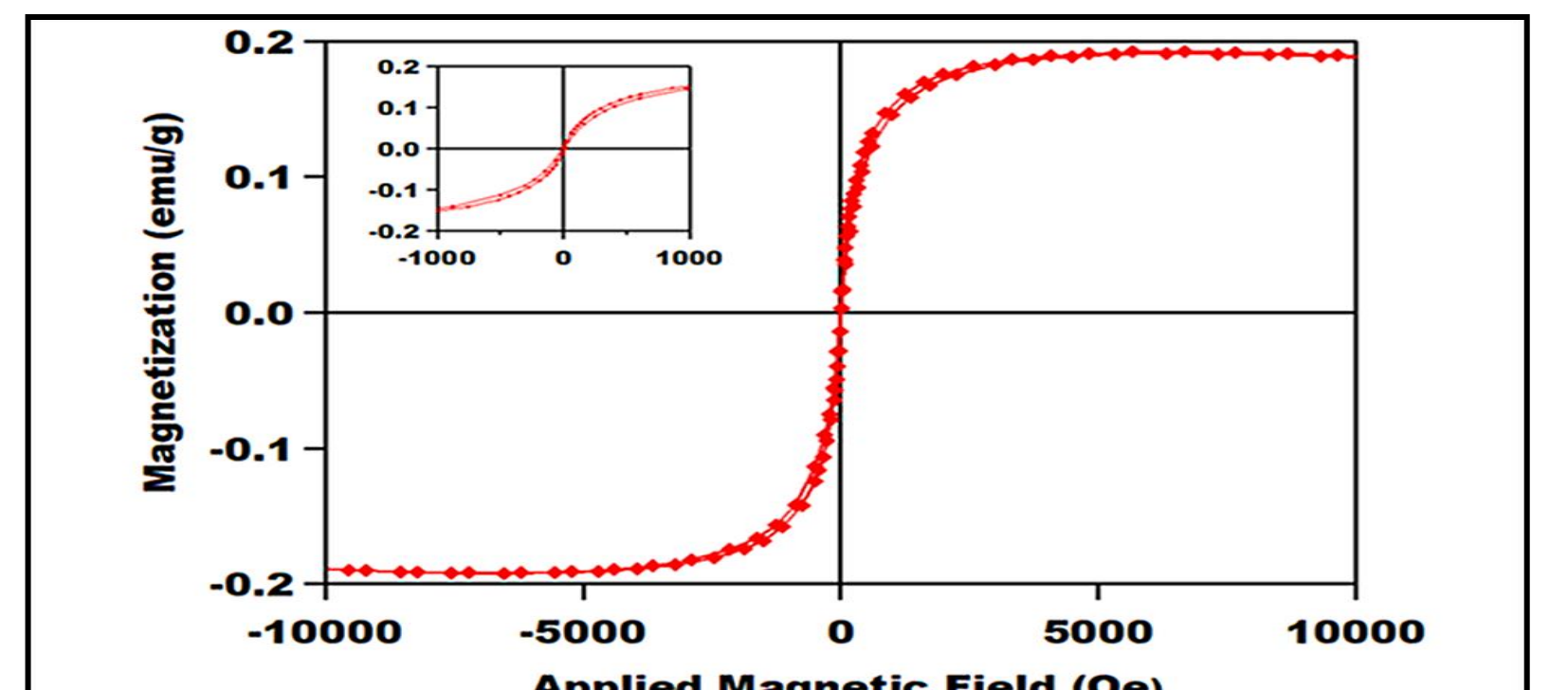
SEM Analysis



EDX Analysis



Magnetization Measurements



Conclusion

- Discarded tuna cans were converted into magnetite (Fe₃O₄) nanoparticles (34% yield) via a simple calcination method.
- Fe₃O₄ nanoparticles acted as solid stabilizers in Pickering emulsion polymerization of styrene.
- Stable O/W emulsions formed over 0.5-4.0 wt.% Fe₃O₄ concentration range.
- Polystyrene/Fe₃O₄ composite microparticles exhibited ferromagnetism with 0.19278 emu/g saturation magnetization.
- Potential applications include targeted drug delivery, environmental remediation, and magnetic sensing.