Preconcentration and selective removal of cadmium (II), Lead (II), and Antimony (III) using multi-template magnetic halloysite nano clay imprinted polymers

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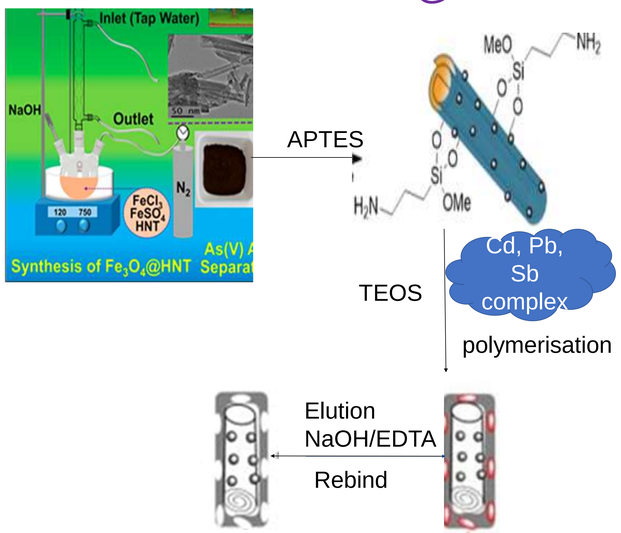
INTRODUCTION

Heavy metals are the most toxic, persistent, and non-biodegradables, threatening humans and other living organisms (Li et al., 2021). They enter the environment mainly through mining, tannery, and fertiliser industries (Gayathri et al., 2021).Even though the lowest maximum allowable limit has been stipulated by different regulatory organisation, there are still massive heavy metals above the permitted level discharged into the aquatic environment yearly, which can travel through the food chain resulting in severe health and environmental problems (Xu et al., 2020). These pollutants have complex matrices and occur in low concentration, making them challenging and costly to analyse directly, hence the preconcentration and separation of the analyte before analyses with ICP-OES. As a result, this project aims to form magnetic multi-template ion imprinted polymers using surface imprinting technique with magnetic halloysite nano clay (HNT) as a supporting material and Cd, Sb and Pb as templates. This method has advantages of low cost, high degree of selectivity for a group of analytes and reduced efforts needed to prepare different IIPS for different analytes separately (Xie et al., 2020).

SYNTHESIS OF FE3O4@HNT-IIP



RESULTS AND DISCUSSION

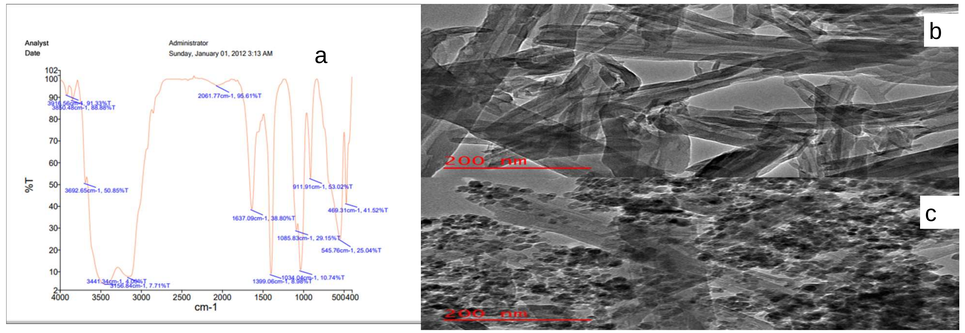


Figure 1: (a)FTIR image of Fe_3O_4@HNT (b) HNT TEM image (c) Fe_3O_4@HNT TEM image

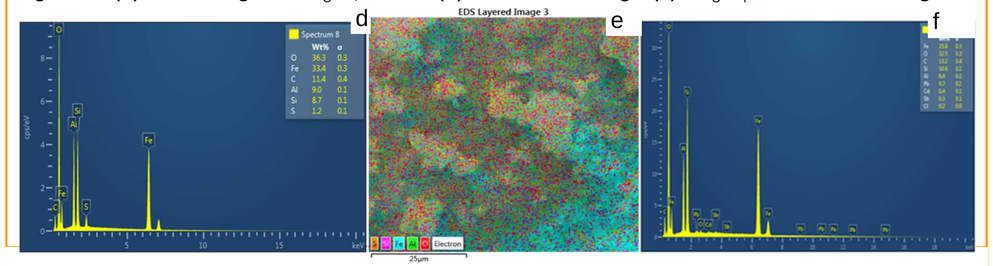
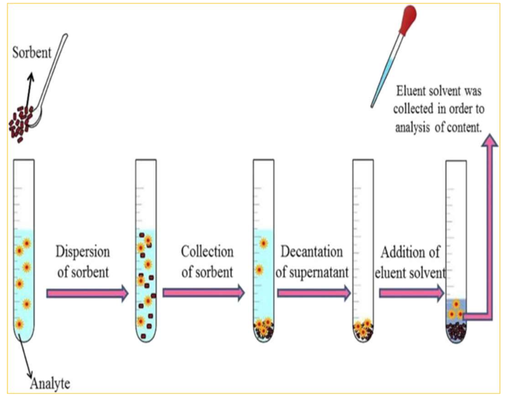


Figure 2: (d) **Fe_3O_4**@HNT SEM EDX (e) SEM mapping of FE3O4@HNT (f) **Fe_3O_4**@HNT-IIP

FUTURE WORK

1. Further characterisation of FE3O4@HNT and Fe_3O_4@HNT-IIP using XRD, VSM and BET
2. Optimization of different parameters and application in real sample with DSPME using ICP-OES



CONCLUSION

1. FTIR spectra confirmed that MHNT formed with the peaks of 545.76 cm^{-1} attribute to FE-O in Fe_3O_4 and 3916 and 3850 cm^{-1} attributed to outer surface O-H and inner surface O-H groups of halloysite clay.
2. The TEM results indicates that the magnetite is embedded in the HNT
3. The presence of Fe, Cd, Pb, Al, Si and O in TEM EDX indicates successful synthesis of Fe3O4@HNT-IIP

References: Li et al., 2021, Usman et al., 2021, Xu et al., 2020, Xi et al., 2020, Gayathri et al., 2021

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