Bio-modified magnetic nanoparticles as a tool for water purification

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Recently purified drinking water has become a primary concern to every human being("Water Scarcity | Threats | WWF," n.d.). According to various reports presently about 785 million people around the world are deprived from having pure drinking water (Troeger et al., 2018). In some cases, either they had to pay a heavy price or processed hard in order to get pure water. Researchers around the world are in continuous search for a cheap, convenient and user-friendly ways for purifying the contaminated ground water(Sharma, 2021). Many of the conventional purifying process are either energy consuming, complex or expensive. Nanoparticles recently emerged as a useful alternative in many applications and most of the times it turned out to be a cheap and efficient alternative(Chaturvedi et al., 2012; Jeevanandam et al., 2018). Use of different nanoparticles are now effectively being used for purification of water(Lu et al., 2016). Biomodified magnetic iron oxide nanoparticles also emerged as one of the cheap and sustainable alternatives for the water treatment(Gutierrez et al., 2017).

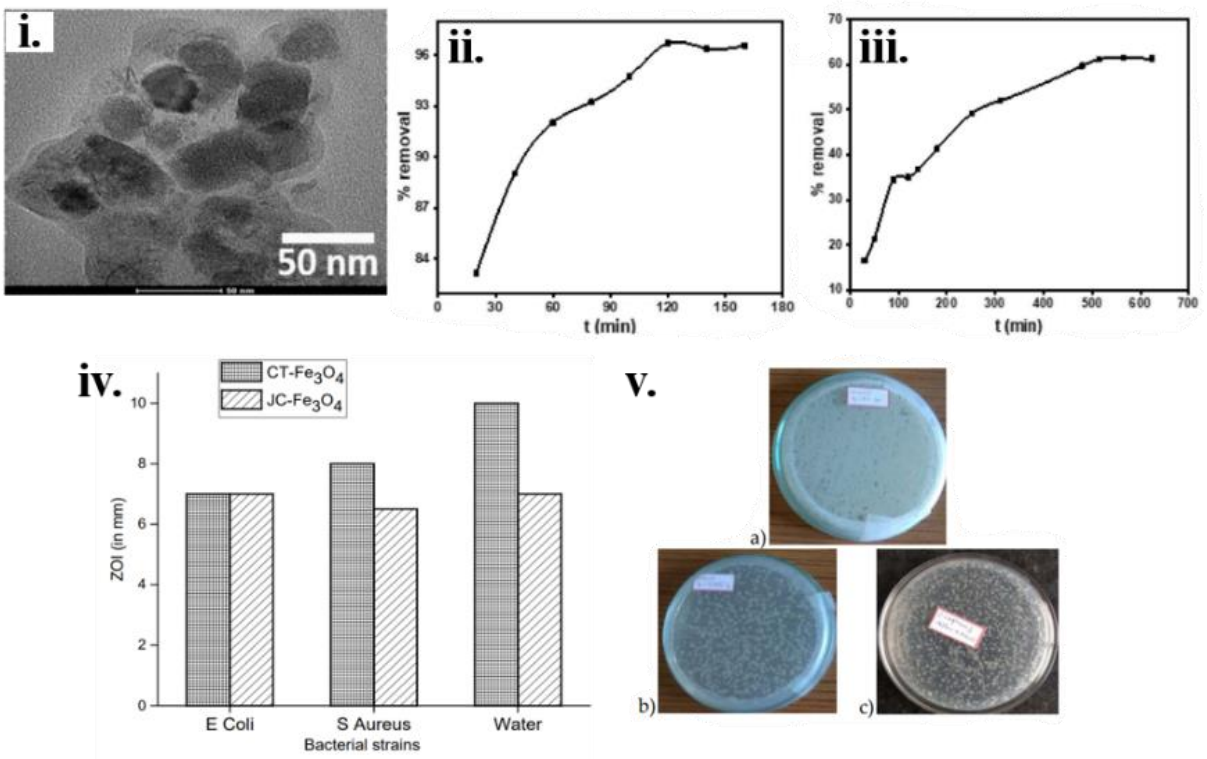

Fig.1 i). HRTEM image of TA@MNPs under resolution scalebar 50 nm; Percentage of removal of ii). methylene blue and iii). Pb(II) ions by particular amount of TA@MNPs from simulated wastewater; iv). Zone of inhibition (ZOI, in mm) with CT@MNPs and JC@MNPs against the bacterial strains (E. coli, S. aureus) pond water bacteria; v). Treatment of pond water bacteria (a. Untreated) with particular amount of b. CT@MNPs and c. JC@MNPs.

Himalayan terai and duars region are well known for its diversity in natural vegetation. In our group we have

synthesized *Cinnamomum tamala*, *Jatropha curcas* (Das et al., 2020)and *Terminalia arjuna* (Das et al., 2022) coated magnetite iron oxide nanoparticles separately and had characterized them by various techniques like TEM, SEM, FTIR, powder XRD, AGM etc. Synthesized biomodified nanoparticles were then utilized for the removal of various toxic metal ions, harmful organic compounds and microbial organisms. In the study it was found that CT@MNPs and JC@ MNPs nanoparticles effectively removes Co^{2+}, Cu^{2+} and methylene blue (MB) dye from waste water. In another case TA@MNP are effective in removing MB (Fig.1.ii) and Pb^{2+} (Fig.1.iii) from stimulated waste water. In case of CT@MNPs and JC@ MNPs, antibacterial property has also been observed for the magnetite nanoparticles (Fig.1.iv and v).

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