SYNTHESIS AND CHARACTERIZATION OF IRON OXIDE NANOPARTICLES FOR REMOVAL OF HEAVY METALS FROM AQUEOUS MEDIUMS

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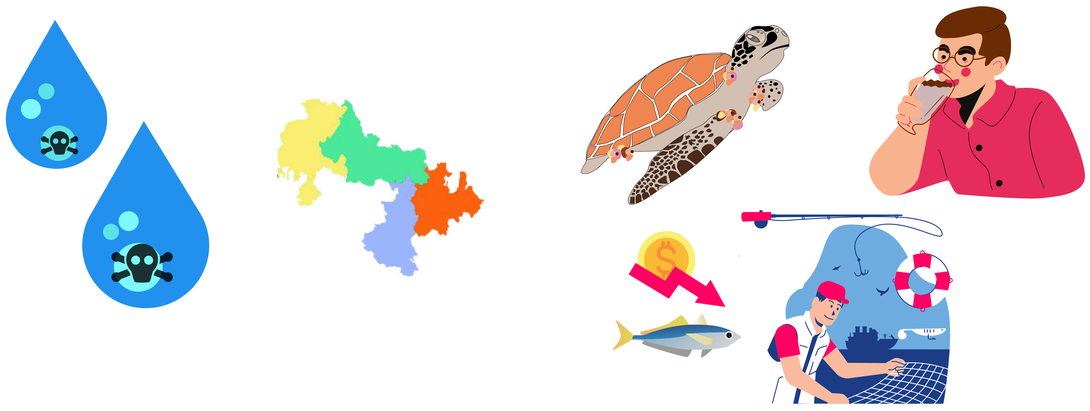
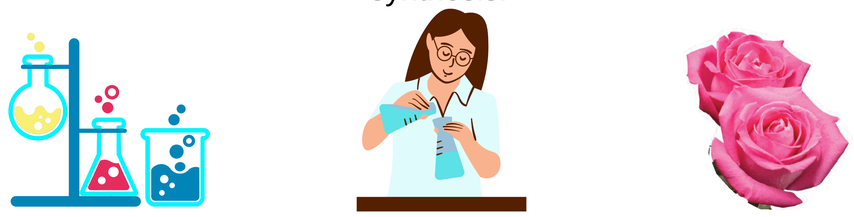
INTRODUCTION

The neglect in the management of toxic waste ends in the affectation of the environment, the human being, and the economy.

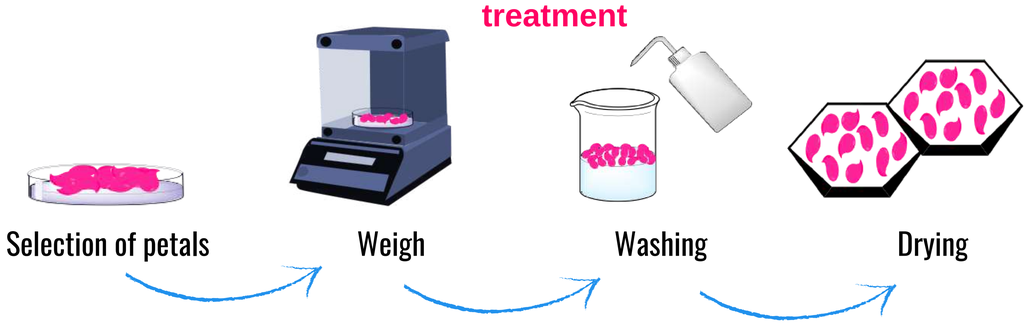


As an alternative, it is proposed the removing of heavy metals through green synthesis.



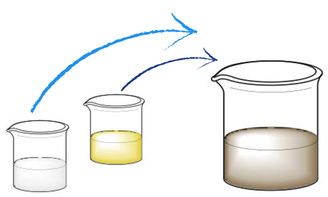
METHODOLOGY

I. Pre-extraction treatment

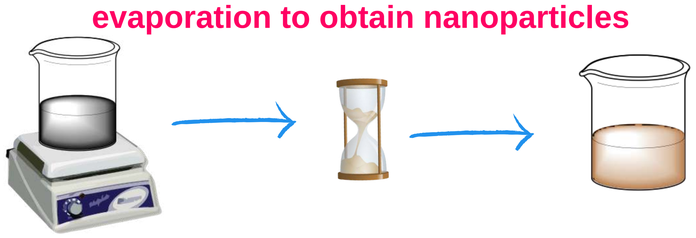


II. Obtain the extract

III. Obtain the precipitate of iron salts after adding NaCl and $FeCl_3 * 6 H_2O$



IV. Before and after of separation for evaporation to obtain nanoparticles



RESULTS AND DISCUSSION

Characterization of the Synthesized Nanoparticles

Figure 1 shows the synthesized nanoparticles at 150,000 X, as can be seen. The nanoparticles show dispersion and spherical morphology, attributed to the agitation that occurred while obtaining the Rosa damascene (RD) extract. The particle ranged from approximately 22.0 to 23.0 nm.

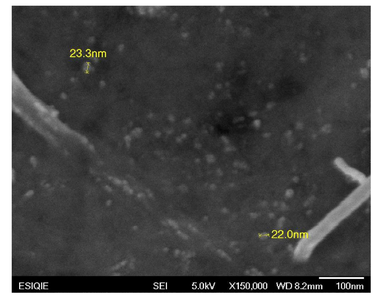


Fig. 1 SEM image of synthesized nanoparticles

Figure 2 shows the presence of organic matter, which is due to the fact that the sample was not calcined before its characterization, but was evaporated. The organic matter comes from the extract of the damascus rose, and it does not show any interference in the functionality of the nanoparticles.

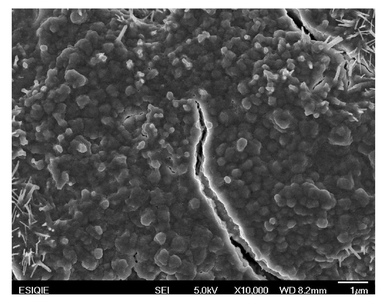


Fig. 2 SEM presence of organic matter between the nanoparticles

By X-ray diffraction, we could identify the type of iron oxide that was synthesized, which matches the magnetite, which matches the open crystallographic database (COD) 00-019-0629. In this letter, four matches were found with the crystalline planes of different families (3 1 1), (4 0 0), (5 1 1) and (4 4 0), which are characteristics of magnetite. There is a magnetite without impurities since no other peaks are shown in addition to those shown by the crystallographic chart 00-019-0629 represented by the blue circles.

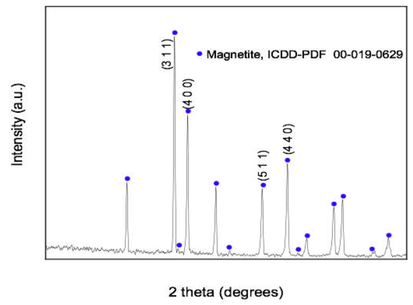


Fig. 3 X ray diffraction spectrum of nanoparticles of magnetite

Characterization of Contaminated Water

As preliminary results, atomic absorption analysis were carried out, in which the absence of arsenic in the water that had been in contact with activated carbon, zeolite and nanoparticles of magnetite was verified, where the initial concentration of arsenic in the water was 648,928 ppm.

CONCLUSION

- The synthesis of iron oxide nanoparticles from the extract of the damascene rose is a simple and environmentally friendly synthesis green method.
- Through SEM, it was found that the particle size is less than 100 nm and was within the range of 22.00-93.03 nm, whose morphology is spherical. Subsequently, by X-ray diffraction, the compounds present in magnetite nanoparticles were identified. With this, information was obtained from them before being in contact with the contaminated water.
- Research shows that activated carbon and zeolite are capable of encapsulating arsenic, however not completely, therefore the consideration of nanoparticle implementation in the final part, proving the great effectiveness of the compounds as a whole to mitigate toxic residue in water.

ACKNOWLEDGMENT

I would like to thank myuniversity that gave me the tools to achieve my goals and become a competitive student. I also thank the Student Chapter of Nanotechnology-Zacatenco for bringing opportunities to students.

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