

Green synthesis of Fe nanoparticles using Citrus maxima peels aqueous extracts

OBJETIVE

Develop synthesize Fe nanoparticles using Citrus maxima peels extracts as reductants and stabilizing reagents, avoiding pollution problems and resource wastes. The characterization was made by TEM, EDS, XPS, FTIR, DLS and Zeta potential methods.

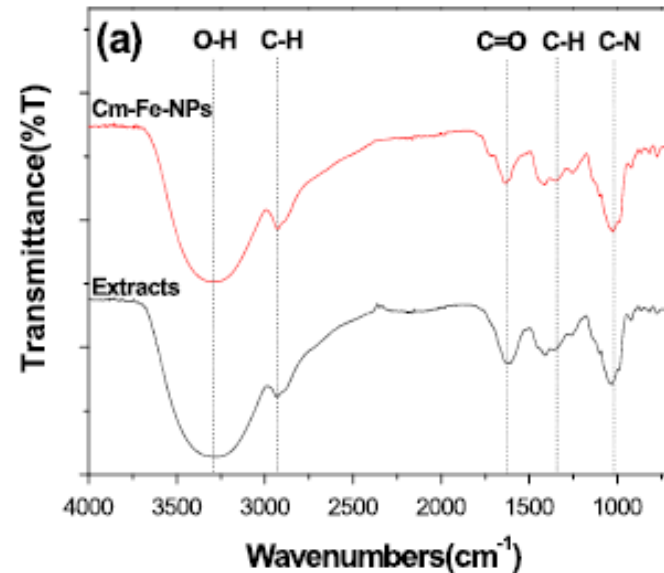
SAMPLE PREPARATION

Citrus maxima peels were washed several times and then milled. 12g of peels were boiled with 100 mL of water at 353 K for 80 min. The extracts were centrifuged and passed through 0.45 μm filter membranes, then stored in a refrigerator at 277 K. Fe nanoparticles were synthesized by adding the extracts to 0.10 mol/L FeCl_3 solution in a 3:1 volume ratio at room temperature. The color changed from yellow to black indicating the formation of Fe nanoparticles. The obtained NPs were expressed as Cm-Fe-NPs.

DATA ACQUISITION

A Nicolet 6700 equipment for FTIR spectroscopy from USA was used to determine the vibration characteristics of chemical functional groups. The reports were made in the mid IR with Wavenumbers in the range $4000 - 1000 \text{ cm}^{-1}$.

REPRESENTATIVE FIGURE AND RESULT



3292.84 cm^{-1} band was assigned to O-H stretching vibration, C=O at 1638.55 cm^{-1} in aldehydes and ketones indicated the presence of phenolic acid and terpenoid. The bands at 1350.99 cm^{-1} (bending vibration of C-H), 1026.60 cm^{-1} (C-N stretching vibration) indicated the presence of phenols and aliphatic amines. These functional groups suggested that the phenols, polysaccharide, aliphatic amines and organic acids existed in the extracts.

The FTIR spectroscopy of Cm-Fe-NPs did not change much compared with the extracts. The shifting of the bands at 3278.05 cm^{-1} , 2930.59 cm^{-1} , 1608.55 cm^{-1} and 1029.80 cm^{-1} , which might be the vibration peaks of O-H, C-H, C=O and C-N, probably implied that the phenols, organic acids and aliphatic amines were stabilizing agents in the synthesis.

CONCLUSION

The green synthesis methods of Fe NPs using Citrus maxima peel extract were feasible which recycled the peel wastes sufficiently and created economic benefits. The FTIR characterization showed the stabilizing agents of the synthesis, restating the success.

REFERENCE

Y. Wei et al, "Green synthesis of Fe nanoparticles using Citrus maxima peels aqueous extracts," *Material Letters*, vol. 185, pp. 384 – 386, 2016.

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