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COVALENT IMMOBILIZATION OF HORSERADISH PEROXIDASE ON BIO-LINKED MAGNETITE NANOPARTICLES

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1. INTRODUCTION

o Recently, much attention has been paid to the development of nanomaterials based on plant extracts, in order to improve their properties and biological characteristics.

o When magnetite is synthesized in the presence of plant extracts, bio-linked magnetite is obtained as a product, which is functionalized and whose properties can be significantly improved compared to chemically synthesized magnetite.

o Bio-linked magnetite particles could be used as carriers for the immobilization of enzymes. By binding enzymes to suitable solid carriers, enzyme properties such as stability and resistance could be significantly improved.

The aim of this study was to investigate the suitability of bio-linked magnetite particles as a solid carrier for the immobilization of horseradish peroxidase (HRP).

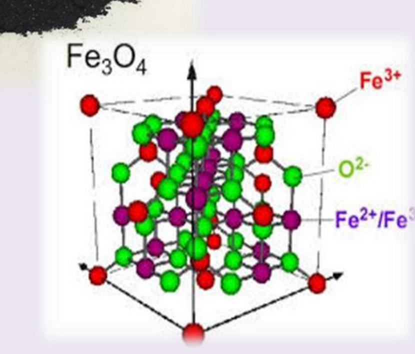
2. MATERIALS AND METHODS

- **Preparation of Bio-linked Magnetite Particles (BMP):** The BMP were synthesized by co-precipitation at 80°C using Fe (II) and Fe (III) salts and *tangerine peel extracts*.

- **Preparation of the biocatalyst (BMP-HRP):** Commercially available HRP was covalently bound to MBC via glutaraldehyde.

Characterization:

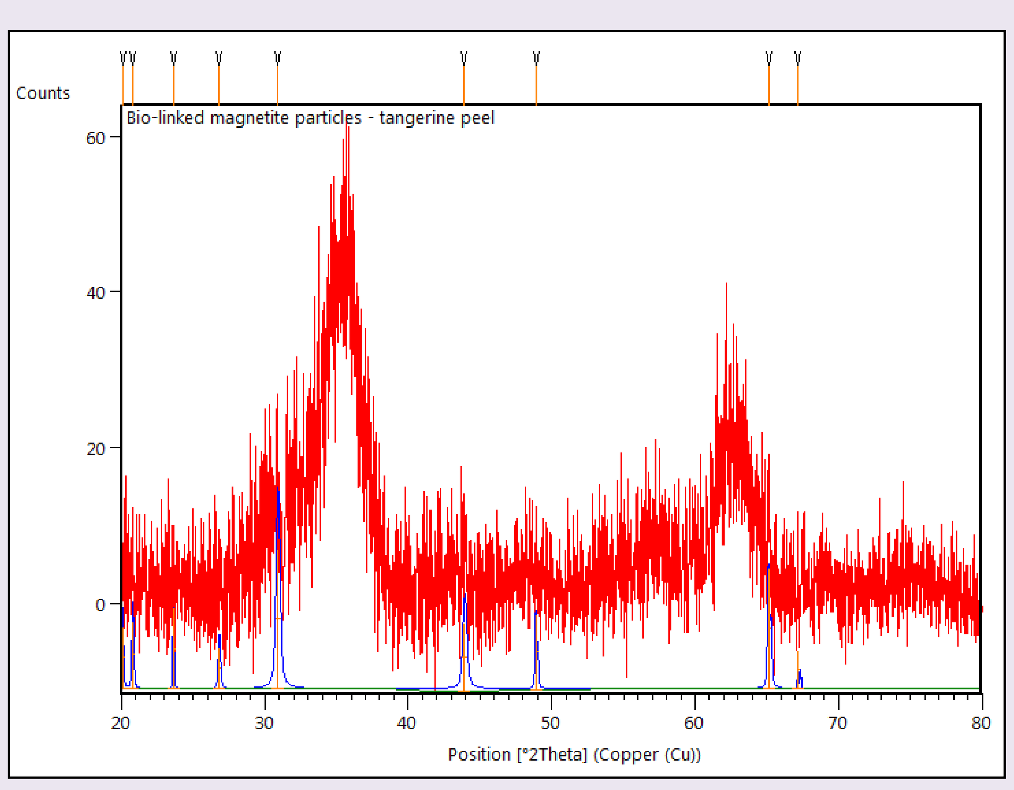
- XRD analysis
- SEM/EDS method.
- Activity of the biocatalyst at different temperatures and pH values



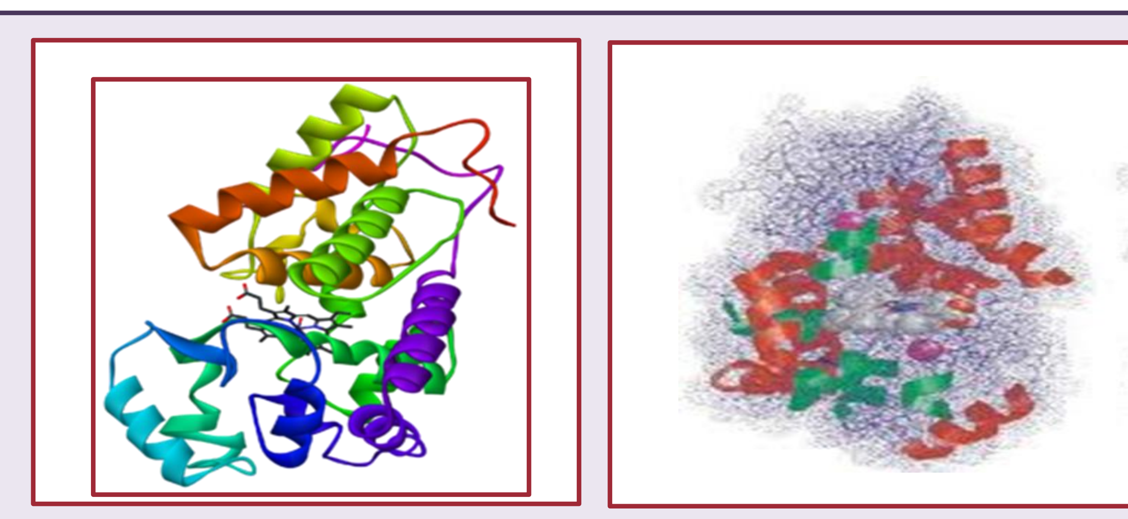
3. RESULTS AND DISCUSSION

Characterization of bio-linked magnetite particles

XRD characterization

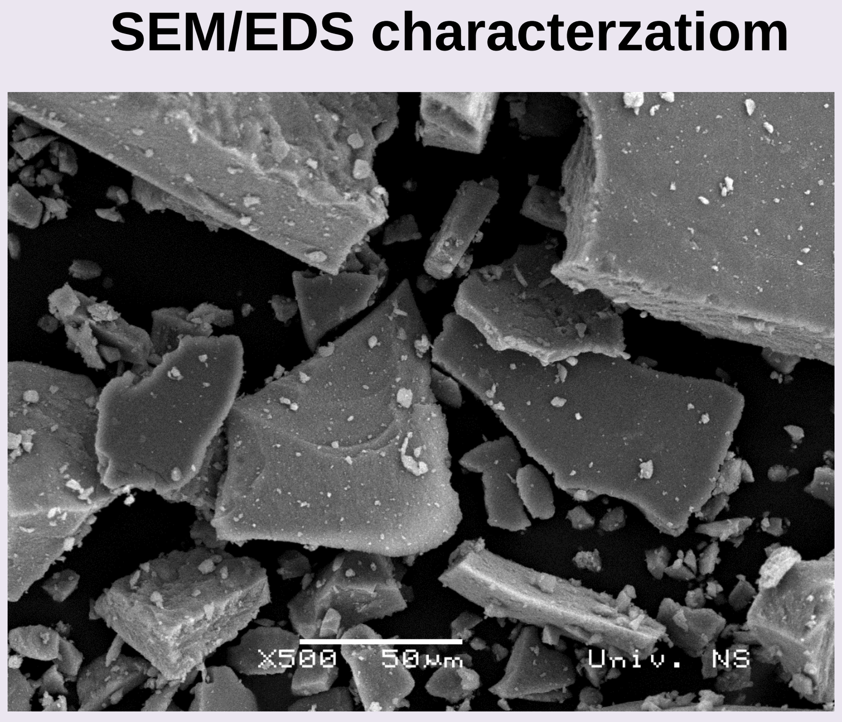


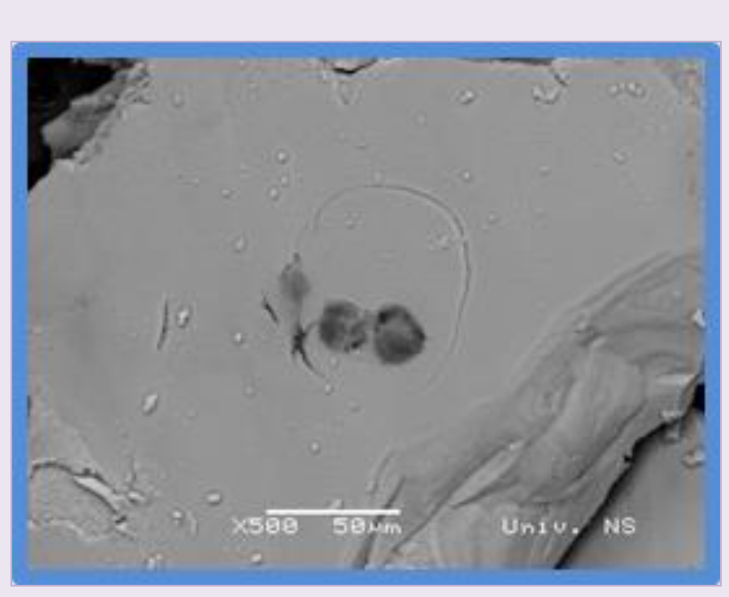
According to the XRD analysis, Bio-linked magnetite particles were synthesized by the co-precipitation method from Fe (II) and Fe (III) sulfate salts in the presence of plant extract (Ref. Code 96-900-2322).



Free and immobilized enzyme

SEM/EDS characterzatiom

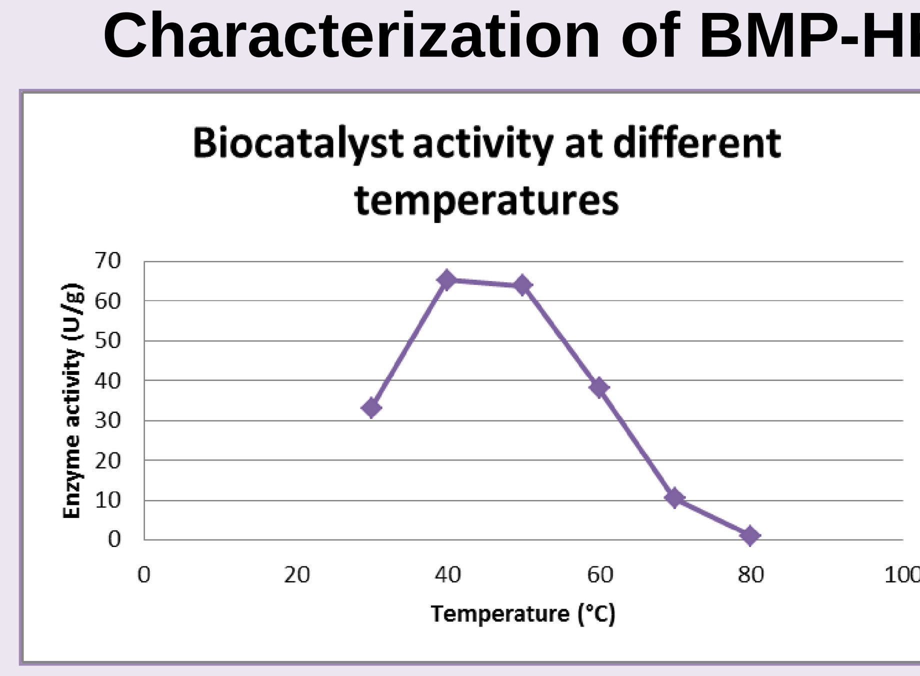


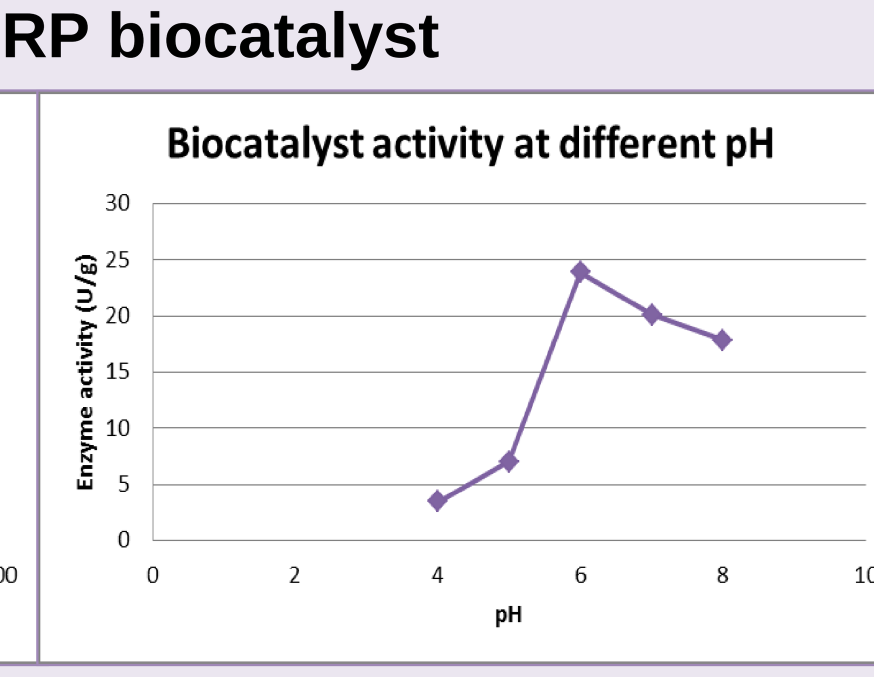


Elemental composition of BMP

Sample	Elemental composition (wt.%)						
	Fe	O	C	Na	K	S	P
Bio-Fe_3O_4	62	22	13	0.5	0.7	0.4	0.9

Characterization of BMP-HRP biocatalyst





Immobilized HRP shows high activity at 40 and 50°C, with the temperature of 40°C being considered optimal.

The activity of the biocatalyst increases with the increase of pH value from 4 to 6. The maximum activity was achieved at a pH of 6.

4. CONCLUSIONS

Bio-linked magnetite particles are suitable carrier for HRP immobilization. The obtained biocatalyst showed high enzyme activity at different pH and temperature conditions.

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