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Booklets

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Title: Comparison of methods for obtaining a hydroxyapatite and zinc oxide composite (HAp/ZnO)

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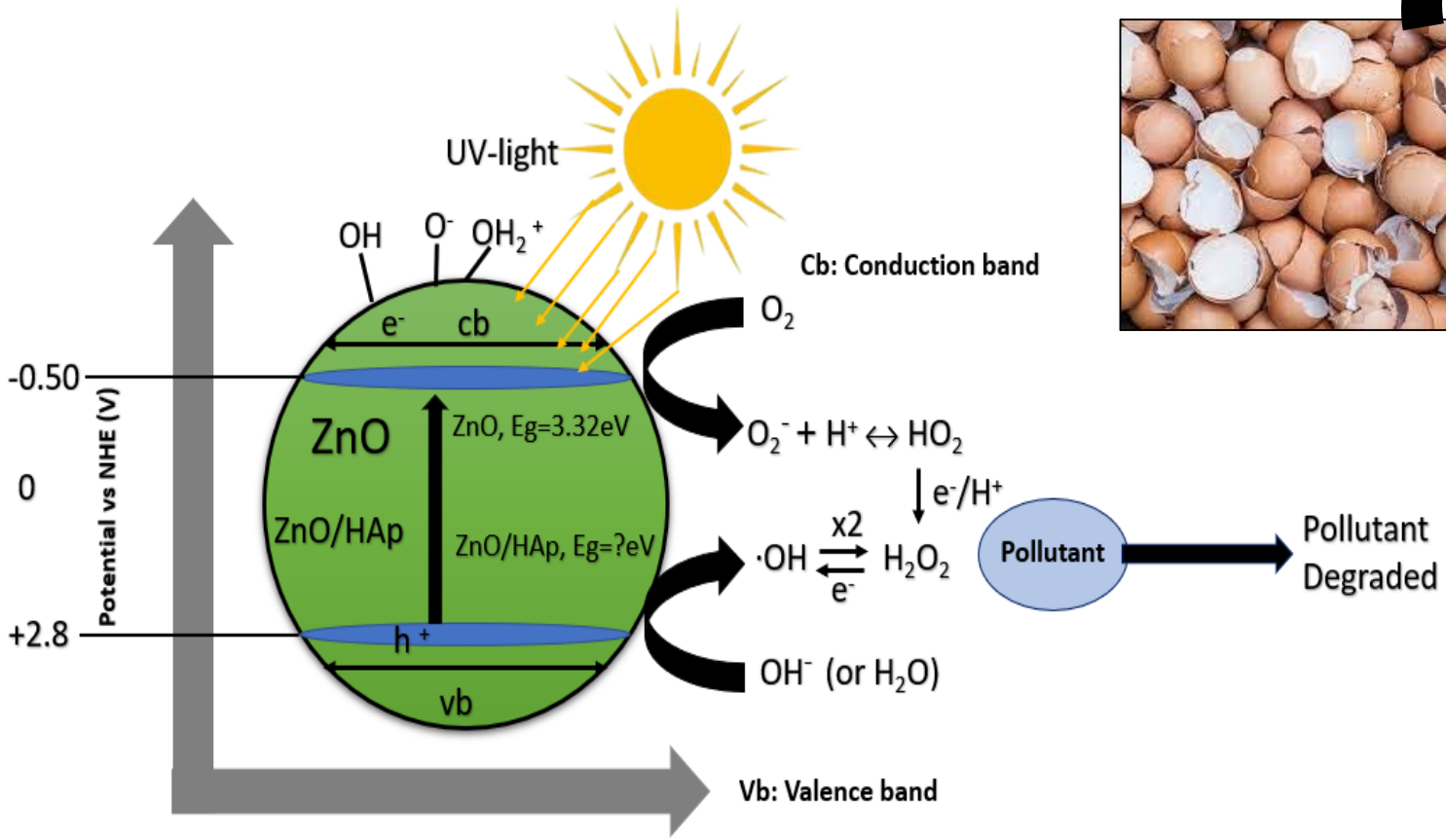
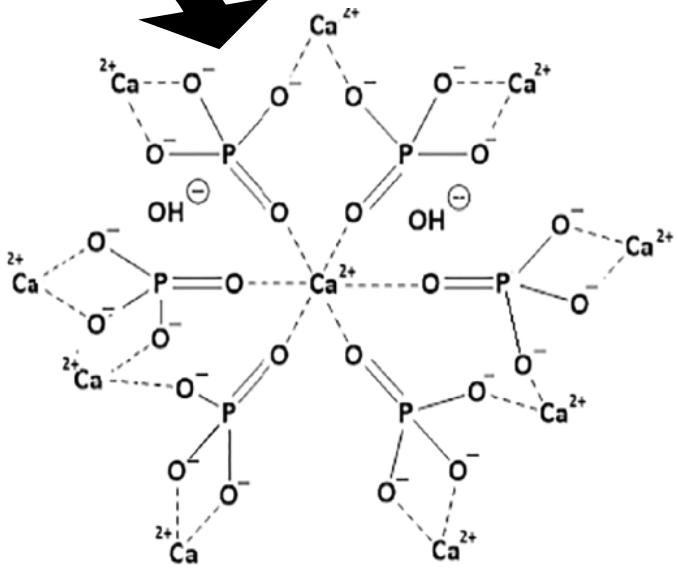
Discipline: Physics of the solid state
Subdiscipline: Composite materials

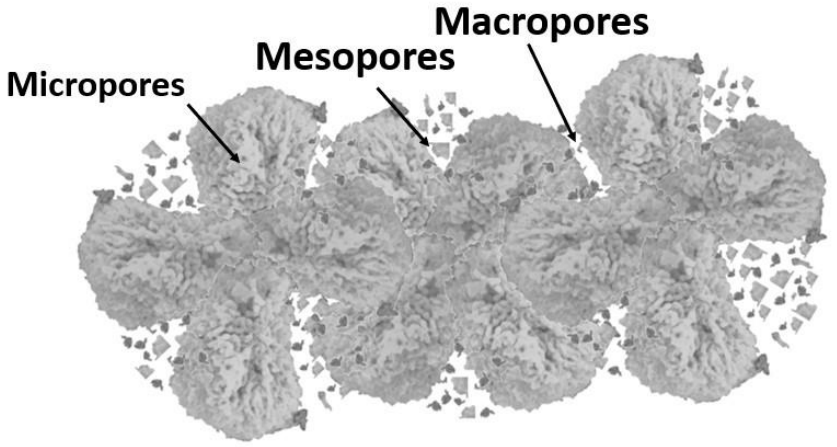
PRESENTATION CONTENT

- Introduction
- Objective
- Methodology
- Results
- Conclusions
- References

INTRODUCTION

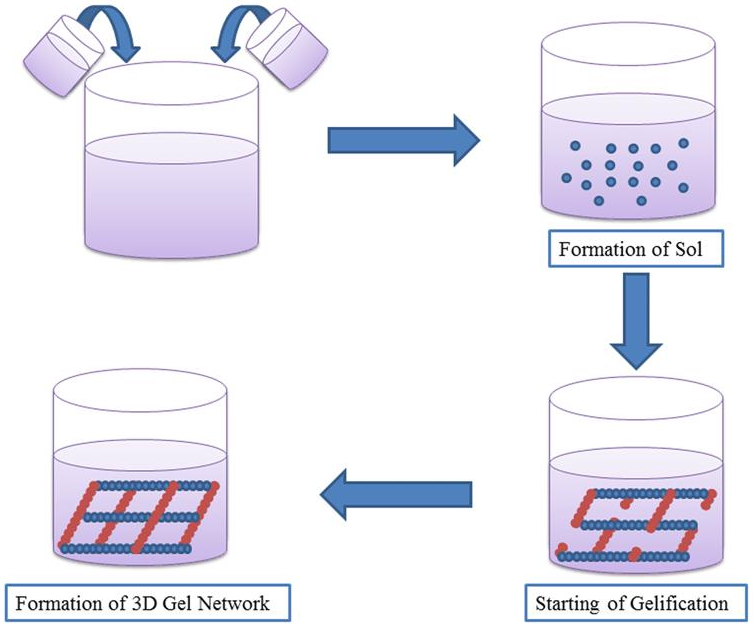




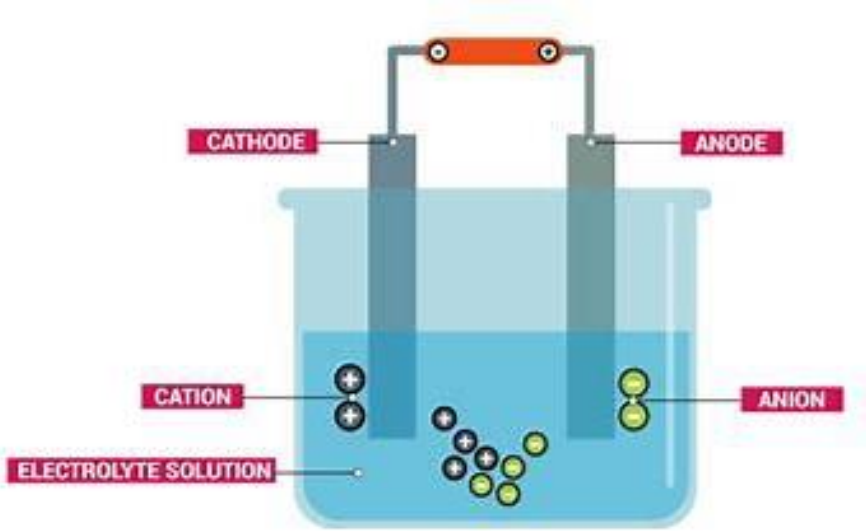


OBJECTIVE

Evaluate two types of synthesis, in order to know which of them allows to obtain a homogeneous composite material of HAp and ZnO.



Sol-Gel synthesis



Electrolysis synthesis

METHODOLOGY

Synthesis

Hydroxyapatite
ZnO Sol-Gel
ZnO Electrolysis
HAp/ZnO Sol-Gel
HAp/ZnO Electrolysis

Characterization

Scanning Electron Microscopy
Energy Dispersive Spectroscopy
Fourier-Transform Infrared Spectroscopy
X-Ray Diffraction

RESULTS: SCANNING ELECTRON MICROSCOPY

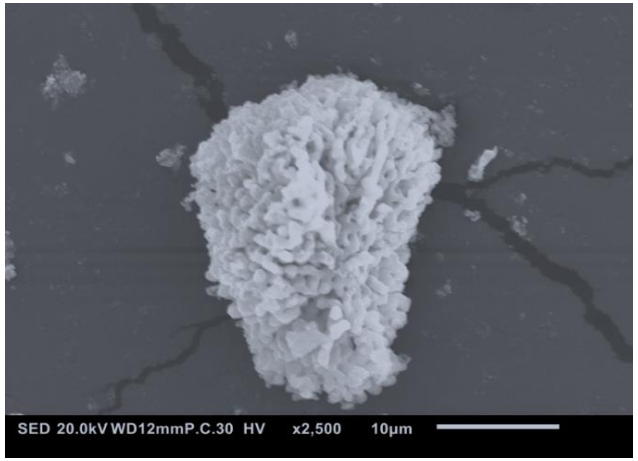


Figure 1. Hydroxyapatite Micrograph.

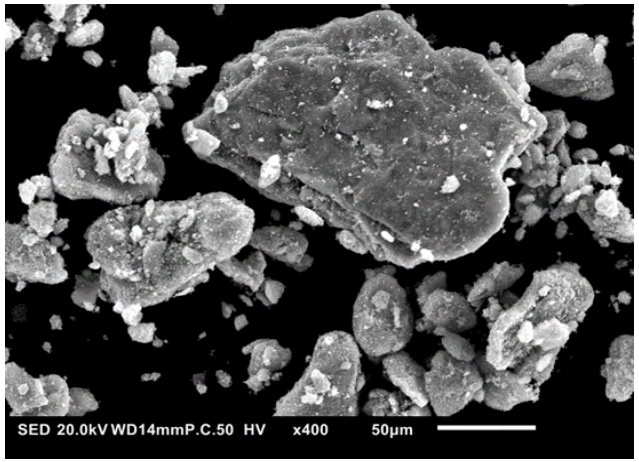


Figure 2. ZnO Sol-Gel Micrograph.

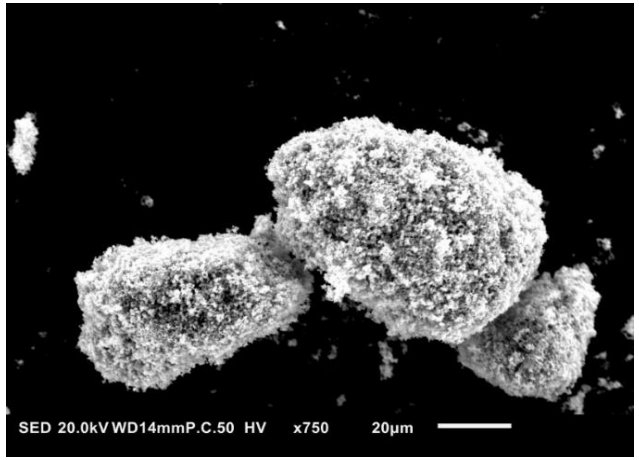


Figure 3. ZnO Electrolysis Micrograph.

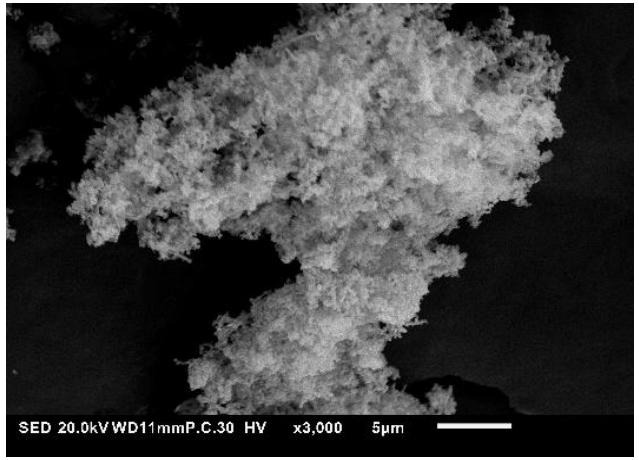


Figure 4. HAp/ZnO Sol-Gel Micrograph.

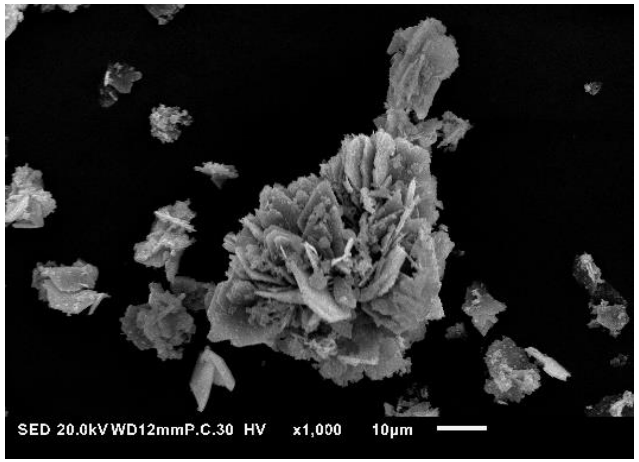


Figure 5. HAp/ZnO Electrolysis Micrograph.

RESULTS: ELEMENTAL ANALYSIS

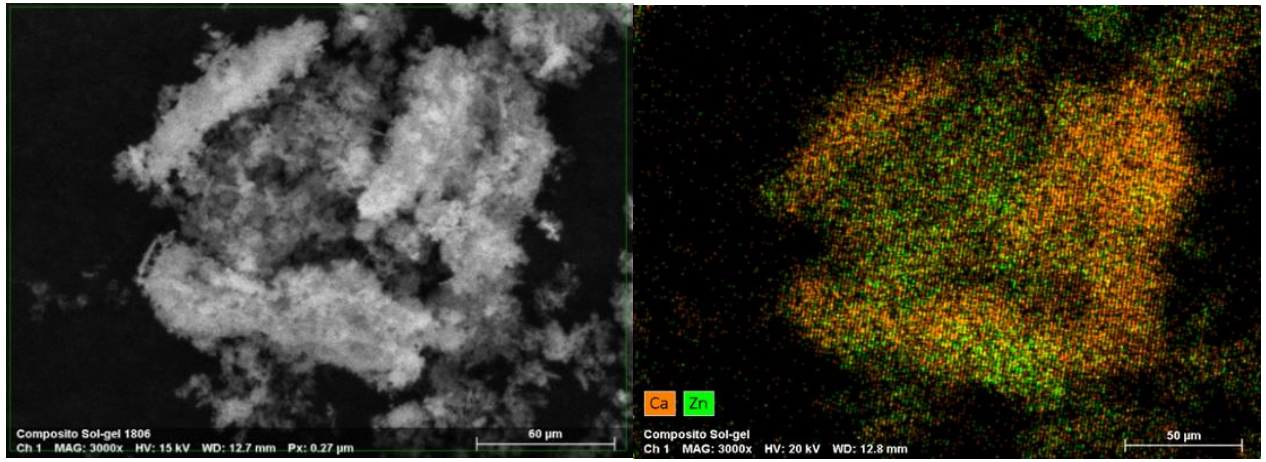


Figure 6. HAp/ZnO Sol-Gel Micrograph and HAp/ZnO Sol-Gel Mapping.

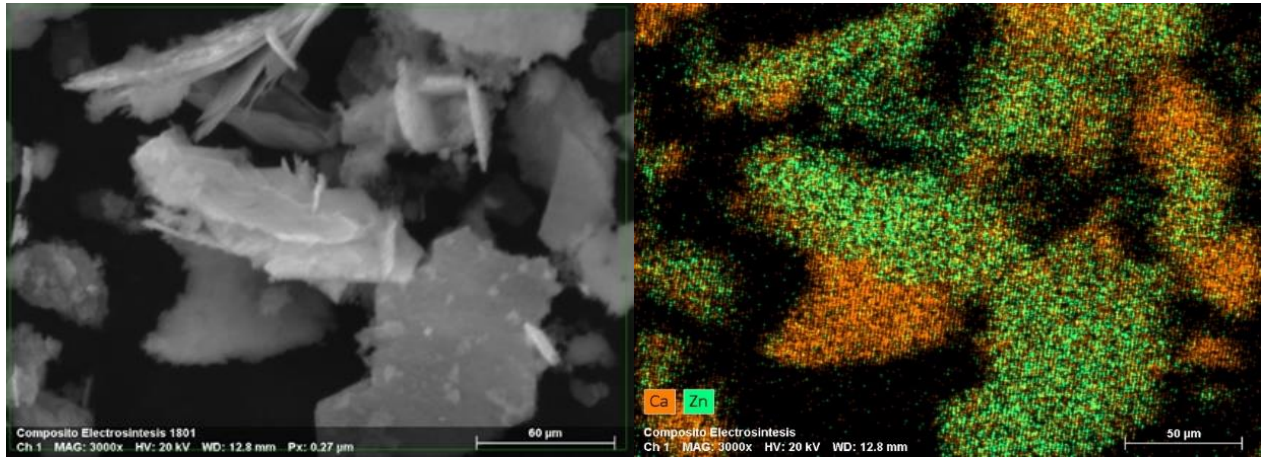


Figure 7. HAp/ZnO Electrolysis Micrograph andHAp/ZnO Electrolysis Mapping.

ZnO, 1:1 atomic ratio

The atomic Ca/P ratio

- The HAp is 38.11.
- The Sol-Gel composites it was 8.91.
- The Electrolysis composites it was 66.25.

This ratio increases with the rise in carbonate ion content, as the CO_3^{2-} ion replaces PO_4^{3-}

The atomic Ca/Zn ratio

- The Sol-Gel composites it was 2.38
- The Electrolysis composites it was 33.13

These ratios are associated with the formation of composites.

RESULTS: FTIR SPECTROSCOPY AND X-RAY DIFFRACTION

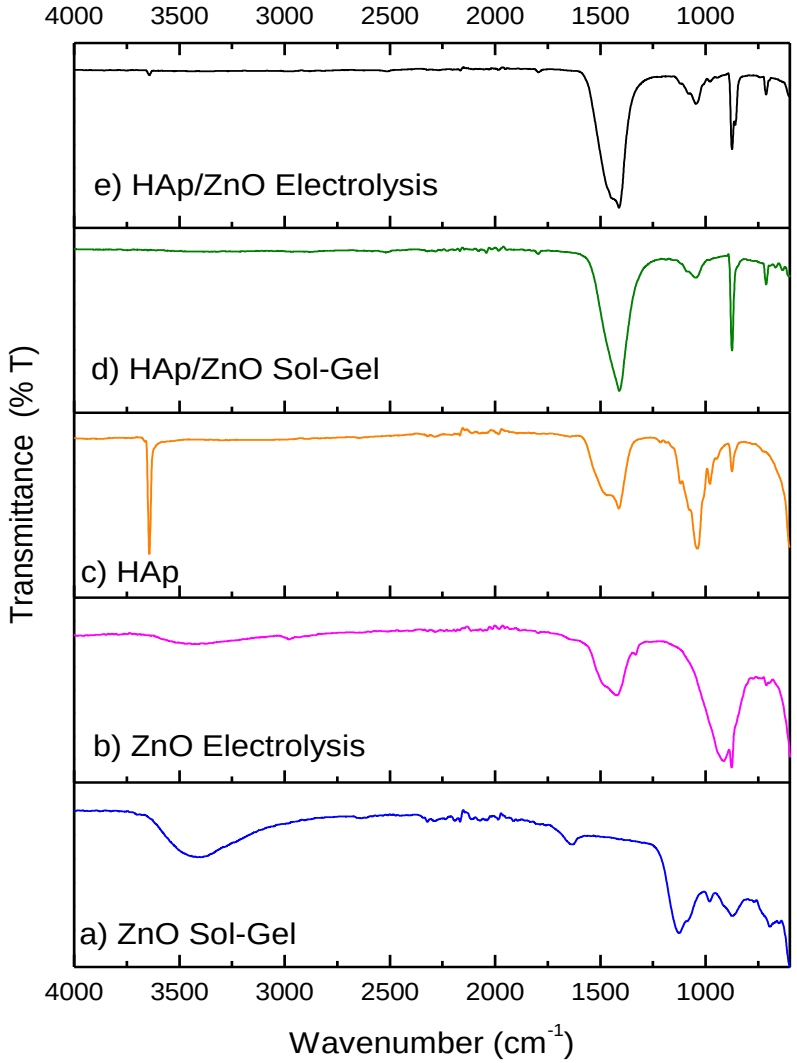


Figure 8. Spectra of FTIR.

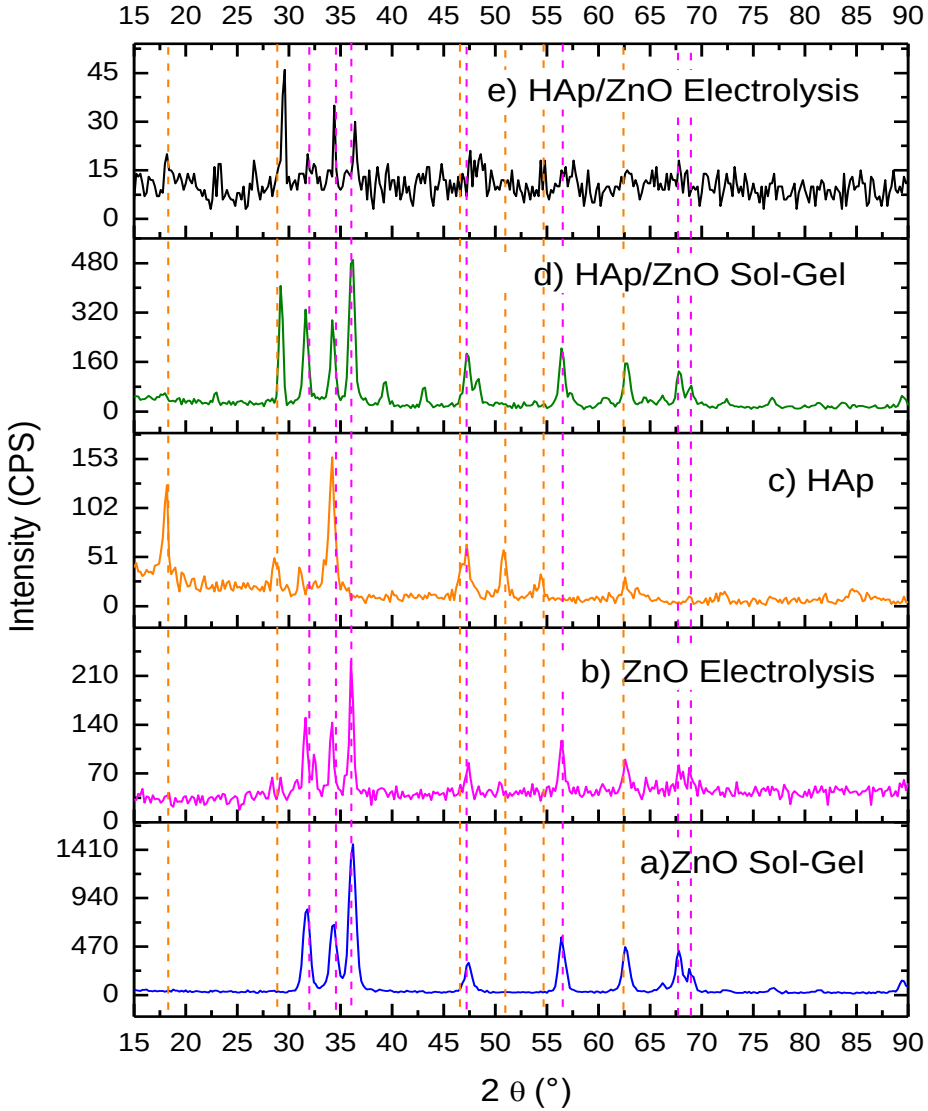


Figure 9. Diffractograms.

CONCLUSIONS

The HAp/ZnO composite was obtained through two synthesis routes (Sol-Gel and Electrolysis); to achieve homogeneity, hydroxyapatite was added during the preparation of the ZnO precursor, followed by a thermal treatment.

In the scanning electron microscopy images, the influence of the synthesis method on morphology is evident. Through electrolysis, the formation of agglomerated sheets is observed, whereas in the Sol-Gel method, no defined morphology is seen, and only pores are observed, which could facilitate the photocatalytic process. The elemental analysis allowed the quantification of the atomic percentages of each composite, showing that the Zinc drastically decreases in the Electrolysis composite (0.4% At) in comparison whith the Sol-Gel composite with a Zn content of 3.04% At. The mapping shows that Zn and Ca are homogeneously distributed, where Zn associated with ZnO and Ca with HAp.

Infrared spectroscopy confirmed the formation of both composites; however, it is not possible to distinguish between them.

The X-ray diffraction analysis confirmed the presence of HAp and ZnO in both composites. The crystallinity of the Electrolysis composite decreased, which may be associated with the morphological changes and the reduction in the atomic percentage of Zn.

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