Interdisciplinary Congress of Renewable Energies - Industrial Maintenance - Mechatronics and Informatics

Booklets

RENIECYT Registro Nacional de Instituciones y Empresas Científicas y Tecnológicas 1702902 CONACYT

RENIECYT - LATINDEX - Research Gate - DULCINEA - CLASE - Sudoc - HISPANA - SHERPA UNIVERSIA - Google Scholar DOI - REDIB - Mendeley - DIALNET - ROAD - ORCID

Title: Biosynthesis of Nano Metallic Particles

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Editorial label ECORFAN: 607-8695
BCIERMMI Control Number: 2020-04
BCIERMMI Classification (2020): 211020-0004

Pages: 14
RNA: 03-2010-032610115700-14

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Introduction

In recent years nanomaterials have been of great interest to the scientific-technological community for presenting physical, chemical, electronic and magnetic properties different from their macroscopic structures; their dimensions are in a range of the nanoscale (less than 100 nanometers), have a larger surface area, making these materials more active, their quantum effects can produce significant changes in their properties compared to their volume analogues. However, the indiscriminate use of batteries and batteries has caused a great problem at the environmental and health level due to its high level of pollution in soils, water and air, which causes irreversible damage to the ecosystem, as in human health since some components of the batteries can cause damage to the respiratory system, kidneys, cancer of all kinds, etc. Therefore, this research used the biomass of the aquatic lily (Eichhornia Crassipes) as abioresponsive agent, in order to obtain an ecological and economic method in obtaining nanoparticles of ZnO and MnO using discarded batteries of Zinc-carbon type (AA) since there are few methods of recovery of battery waste that are ecological and that provide an important step towards the synthesis of these.

Methodology

SAMPLE EXTRACTION

BATTERY COLLECTION → **Stacks were opened manually** → Component separation

- **Plastic**
- **Paper**
- **casing**
- **Graphite rod**
- **Electrolyte**

SAMPLE PREPARATION

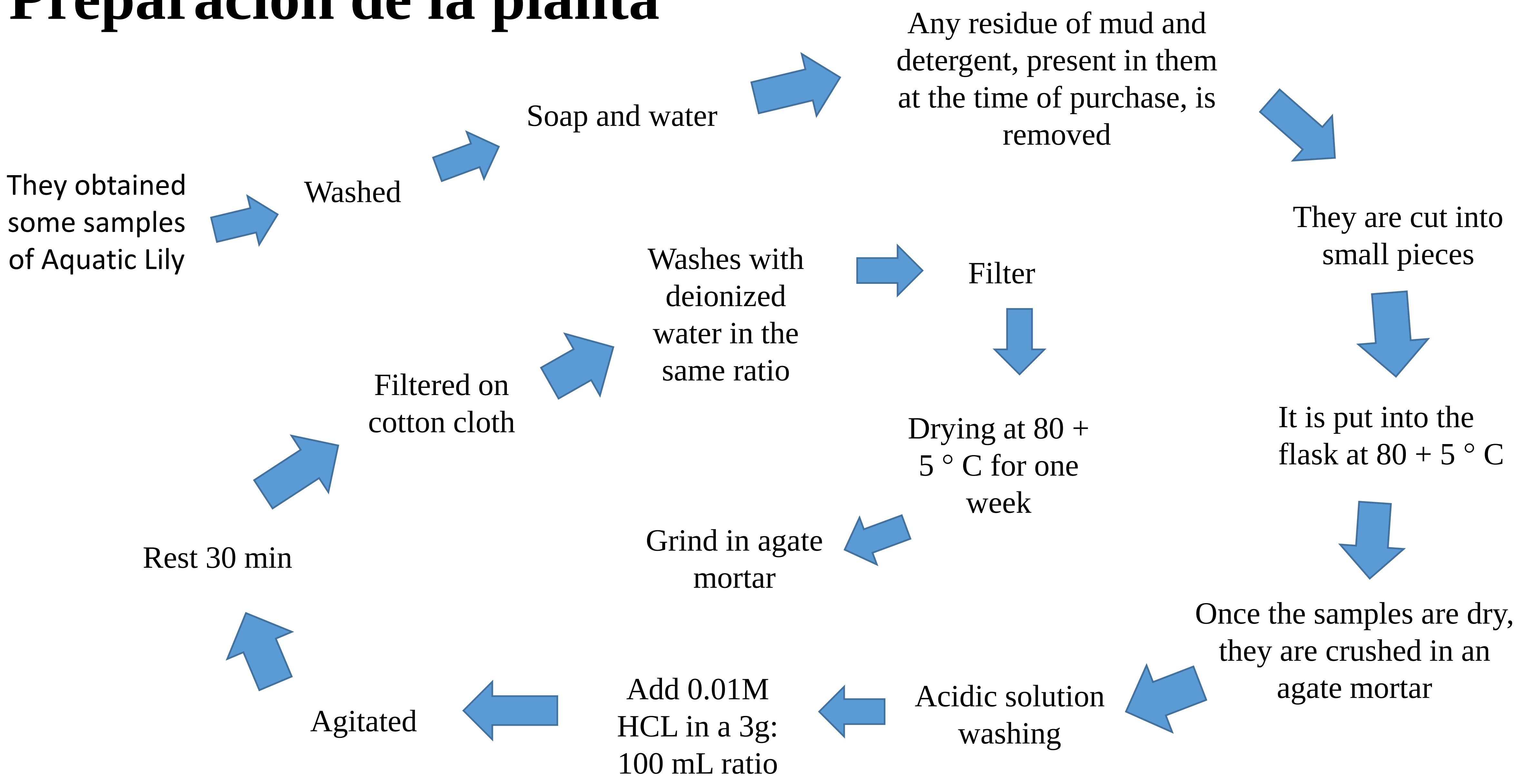
The electrolyte samples (black paste) were allowed to dry at room temperature

→ 1st reading on Rx

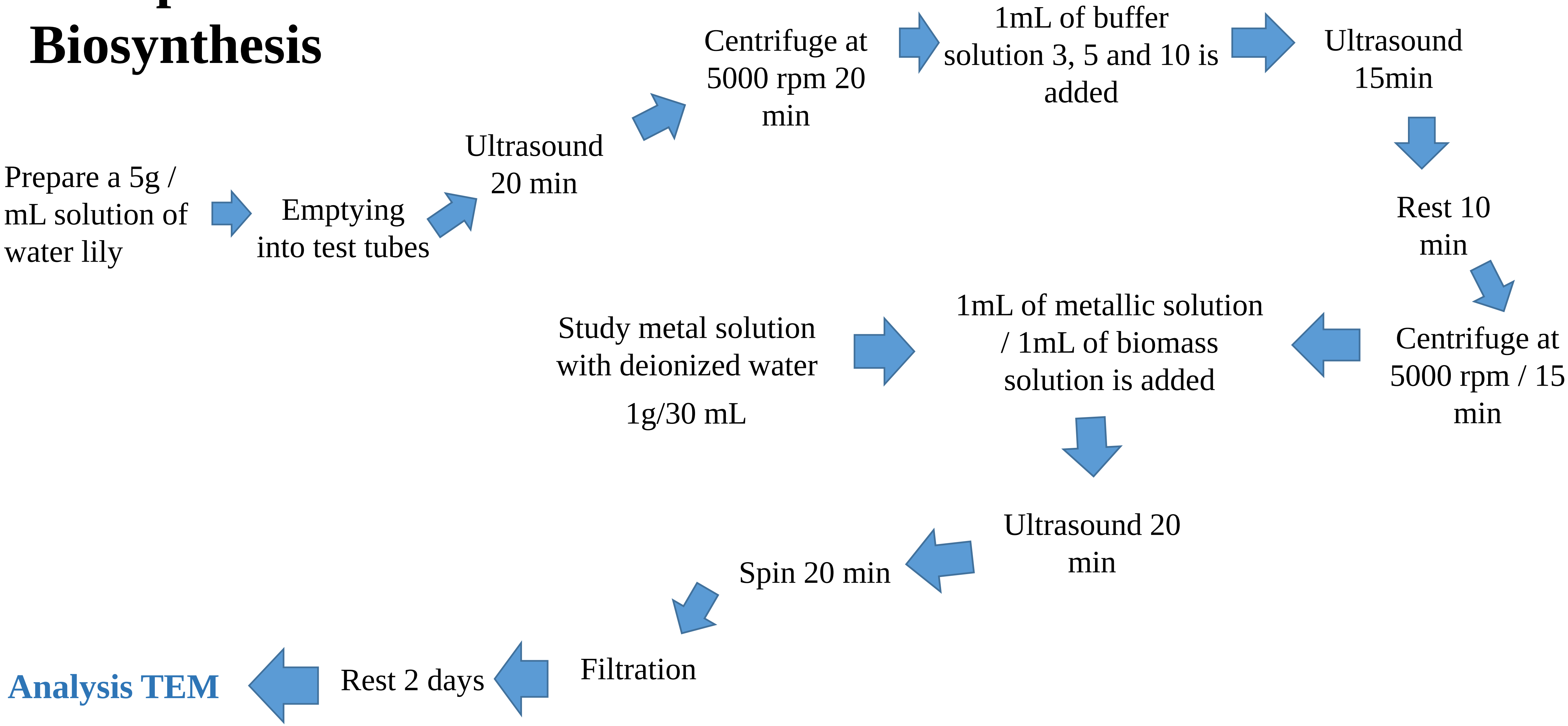
→ 36 hrs in the muffle at 800 ° C

→ More defined phases of the components are obtained

Preparación de la planta

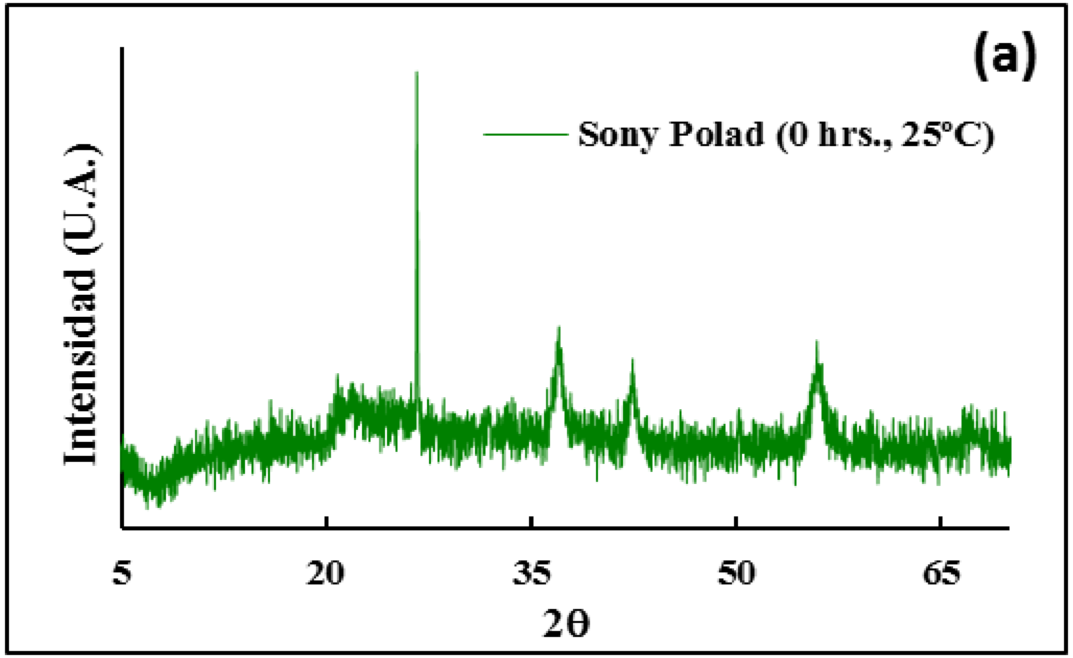


Nanoparticle Biosynthesis



Results

XRD Diffraction Study



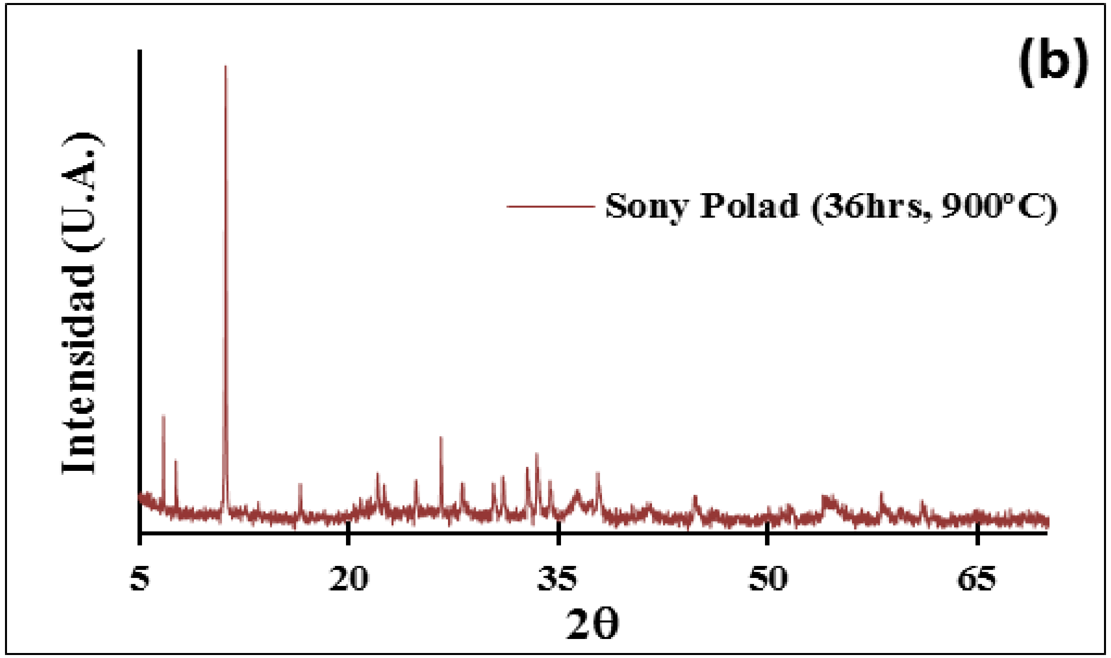


Figure 1.1 X-ray diffraction spectra, obtained in the Sony Polad stack (SP1) at different: a) T = 25ºC and t = 10 hrs; b) T = 900 ºC and t = 36 hrs

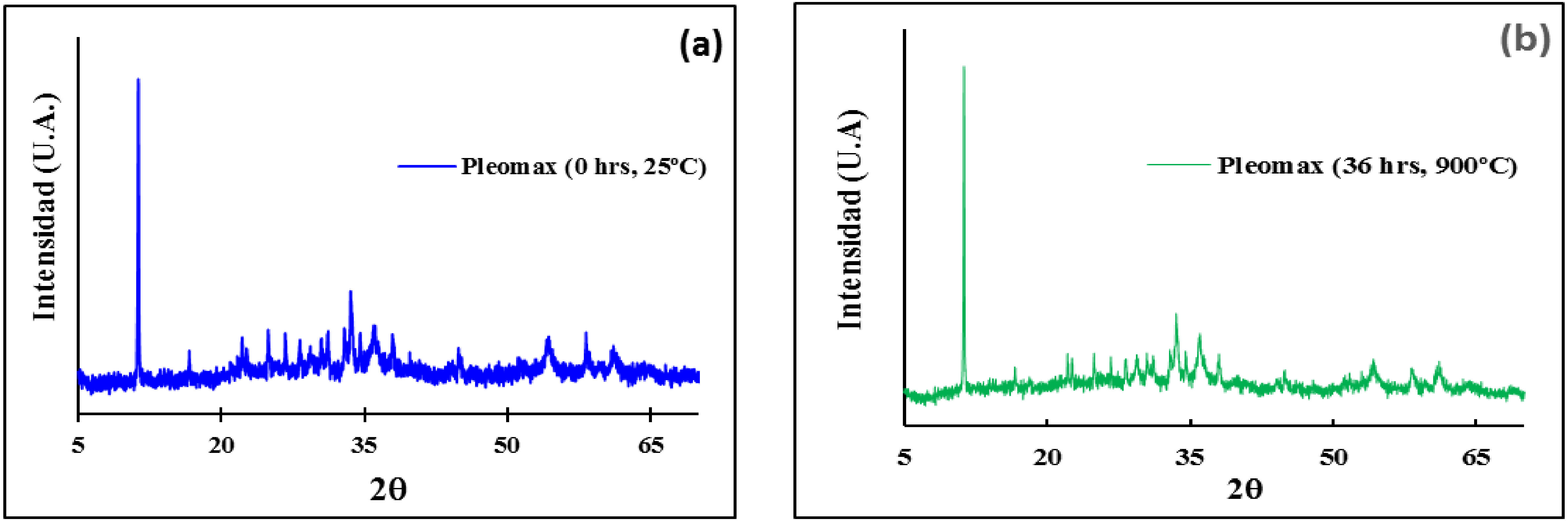


Figure 1.2 X-ray diffraction spectra, obtained in the Pleomax stack (PLx) at different: a) T = 25ºC and t = 0 hrs; b) T = 900 ºC and t = 36 hrs

Transmission Electron Microscopy Study with TEM- microanalysis

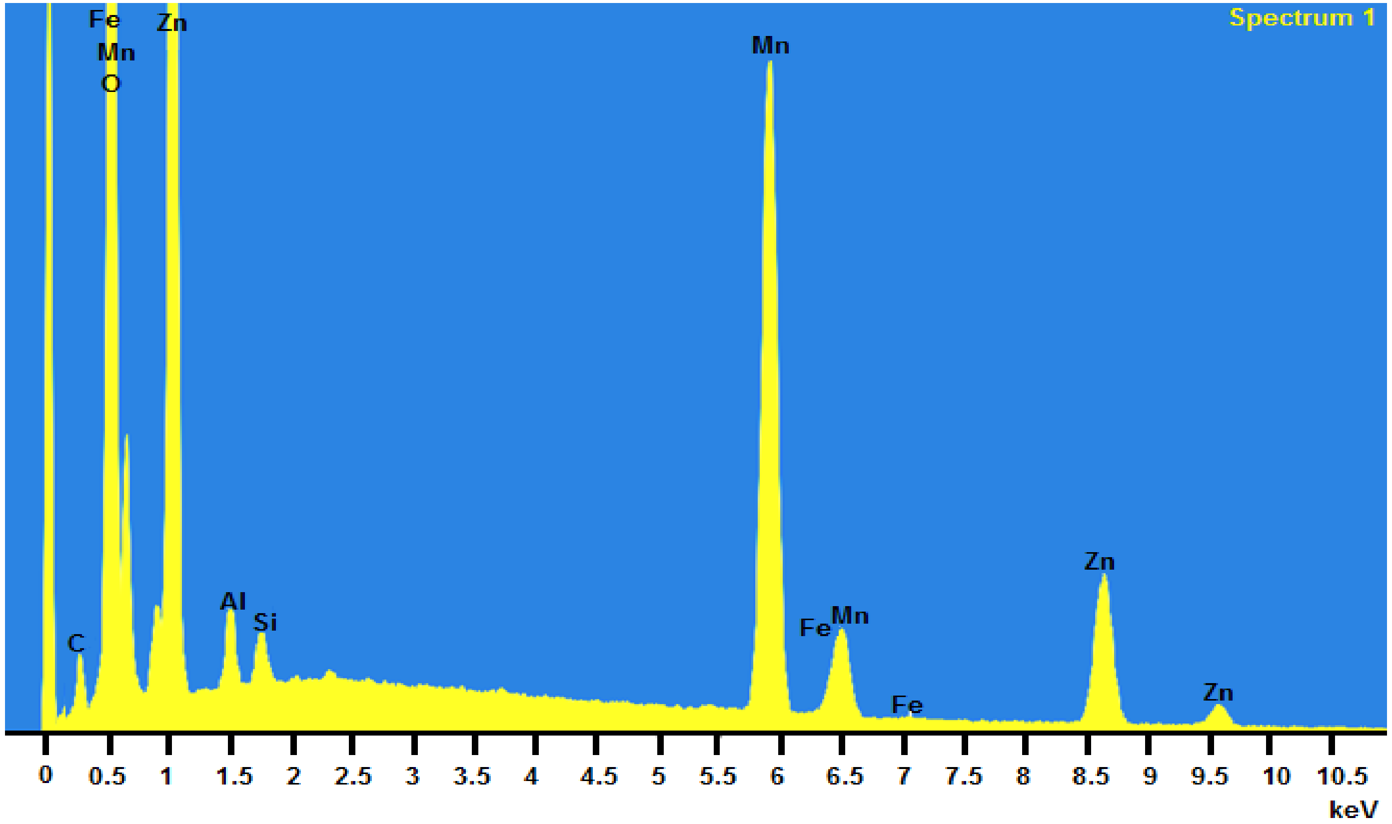


Figure 3. SEM-EDS of the sample (SP1)

Table 1.1 Chemical composition of the sample paste (SP1)

Element	Weight%	Weight% Sigma	Atomic%
C	3.16	0.15	8.22
O	28.16	0.14	54.95
Al	0.92	0.03	1.06
Si	0.58	0.03	0.64
Mn	32.48	0.15	18.46
Fe	1.19	0.10	0.66
Zn	33.52	0.16	16.01
Totales	**100.0**		

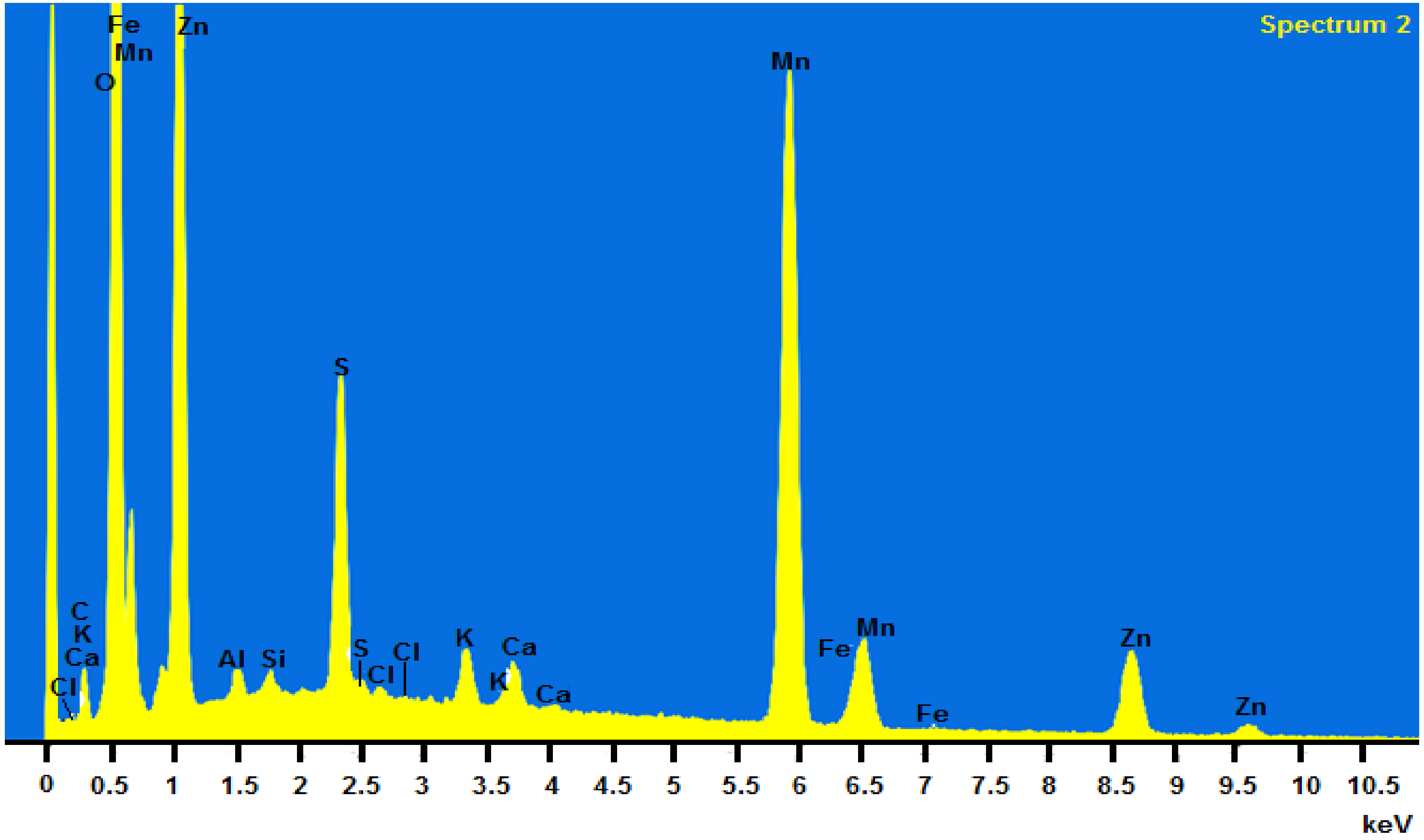


Figure 4. TEM of the sample (PLx)

Table 1.2 Chemical composition of the sample paste (PLx)

Element	Weight%	Weight% Sigma	Atomic %
C	3.11	0.24	7.54
O	31.55	0.17	57.50
Al	0.36	0.03	0.39
Si	0.21	0.03	0.22
S	3.93	0.05	3.58
Cl	0.16	0.03	0.13
K	0.92	0.03	0.68
Ca	0.77	0.03	0.56
Mn	35.41	0.18	18.79
Fe	1.07	0.10	0.56
Zn	22.51	0.17	10.04
Total	**100.00**		

Results of the Biosynthesis of nanometals, using the Transmission Electron Microscopy (TEM) technique

Image 1.1 shows the mapping obtained by TEM of the SP1 sample at a pH value = 3 established for bioreduction, on a scale of: a) 5nm and b) 10 nm.

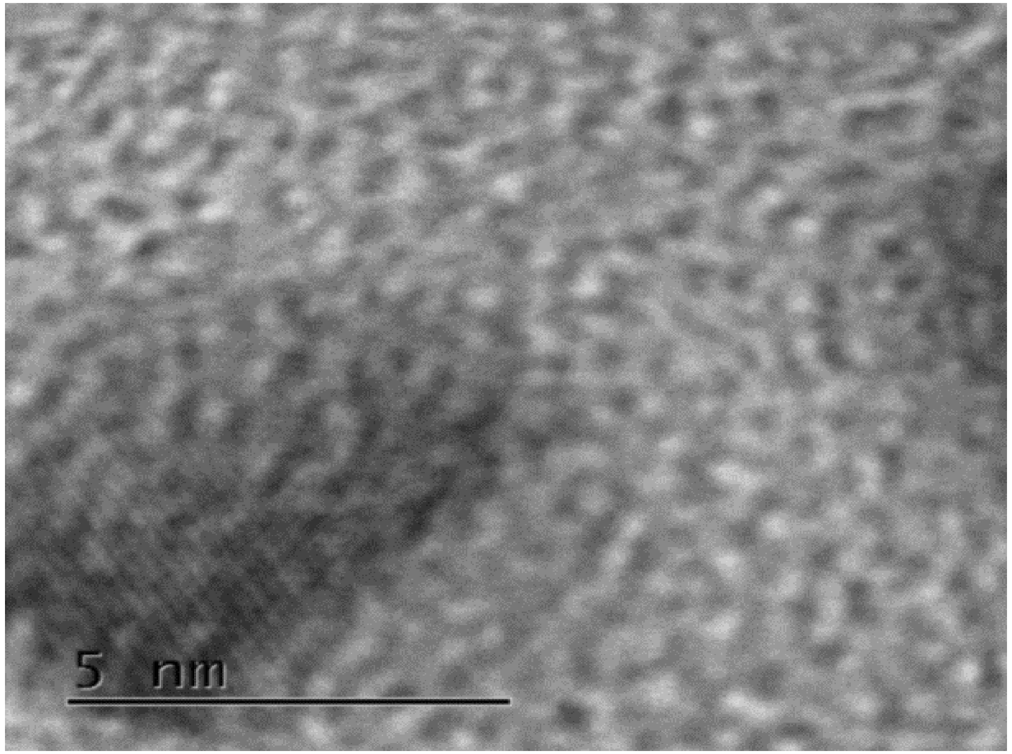


Imagen 1.1 a) pH=3, Escala: 5 nm

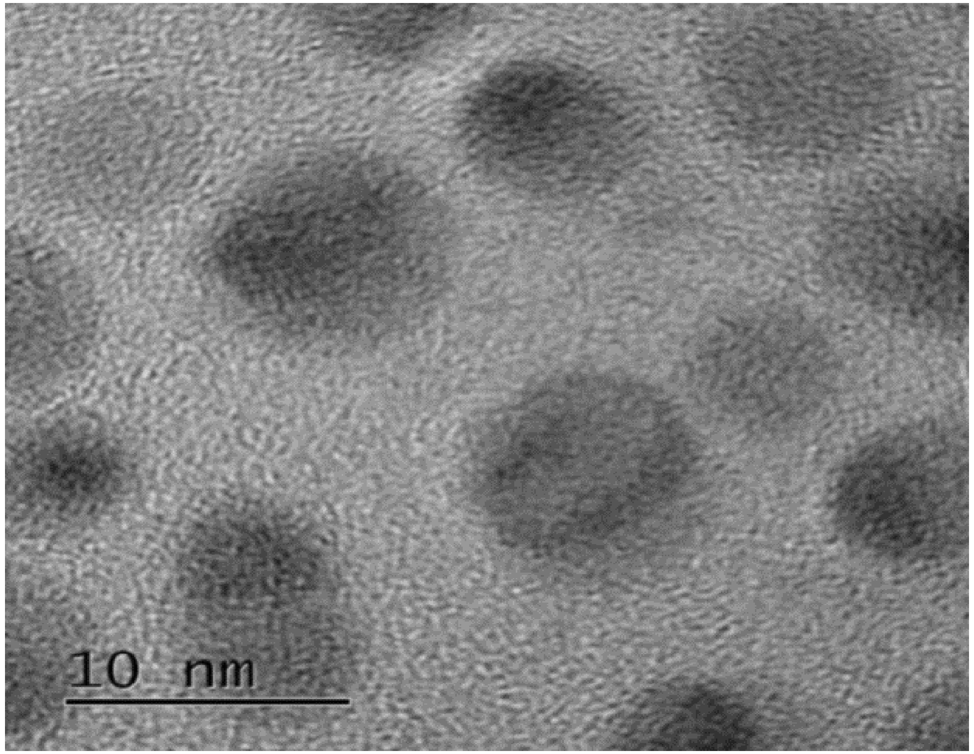


Imagen 1.1. b) pH=3, Escala: 10 nm

Image 1.2 shows the image obtained from the mapping carried out by TEM of the PLx sample at a pH value = 3 established for bioreduction, on a scale of: a) 5nm and b) 10 nm.

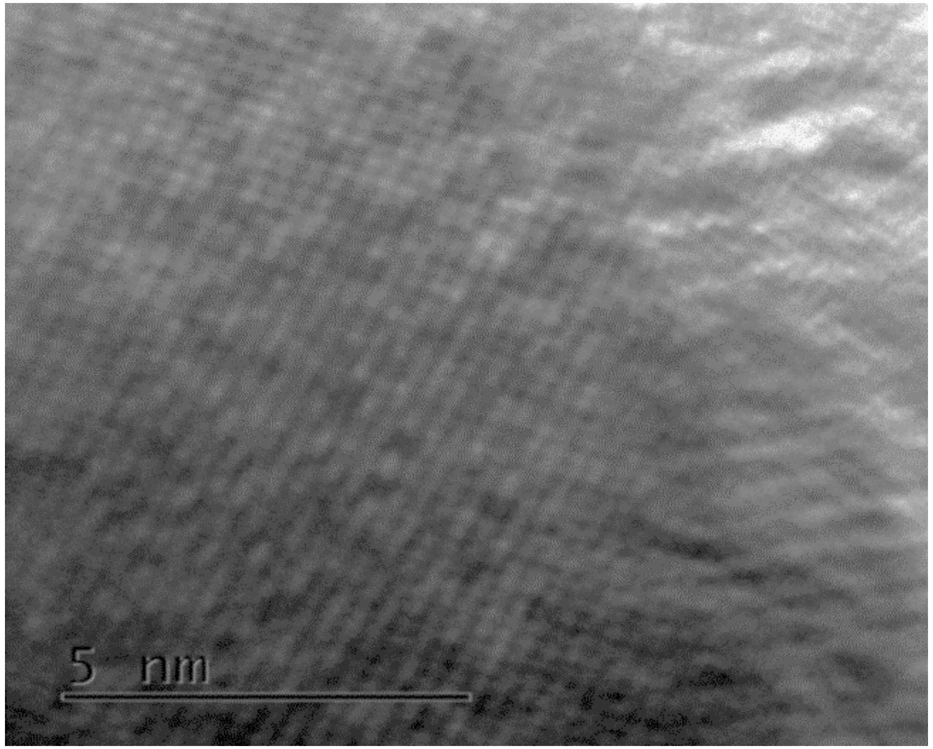


Imagen 1.2a) pH=3, Escala: 5nm

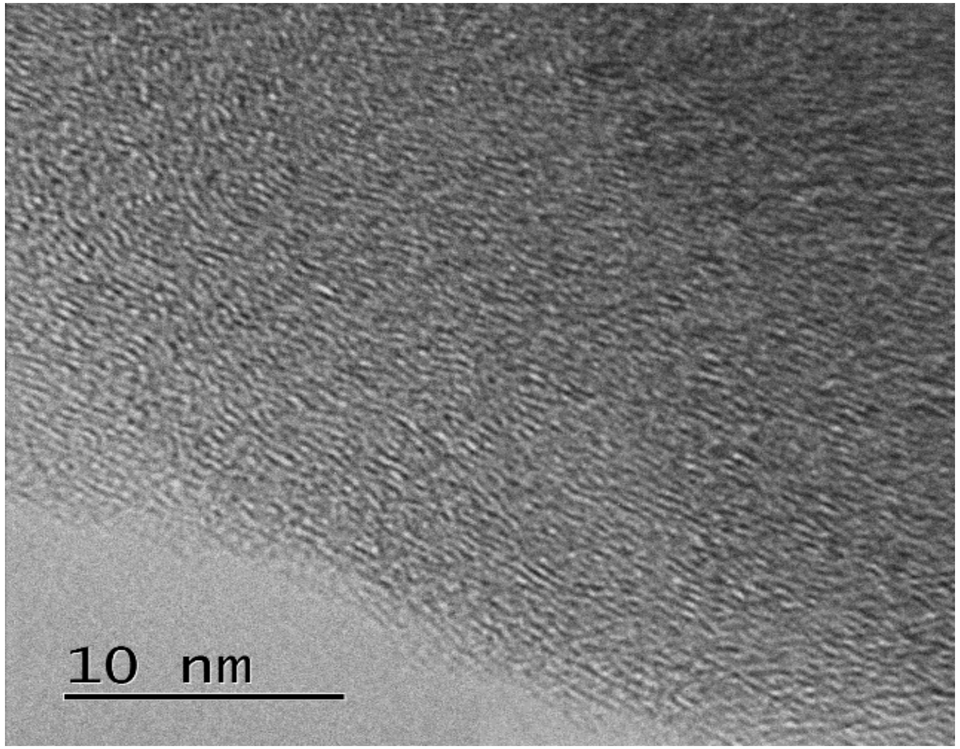


Imagen 1.2b) pH=3, Escala: 10nm

Conclusions

The metallic nonoparticles of ZnO and MnO were obtained in a satisfactory reproducible manner from the discarded batteries of the Sony Polad and Pleomax brands, using the water lily as a bioreducer.

The X-ray diffraction studies allowed to verify the presence of the expected main phases, MgO and ZnO and that there is a better crystallization of the components of the batteries used when they were subjected to a temperature of 900 ° C in a time of 36 hours since they show a better definition in the signals and noise reduction

By means of TEM it was possible to identify the composition of the batteries used and it was observed that they show elements that are not yet reported in the literature, which is clear that some manufacturers use catalysts in order to have a better performance, without considering that at Once discarded, the batteries end up in open-air garbage dumps and the components react, contaminating the soil, water, animals, etc. in an excessive and irreversible way

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