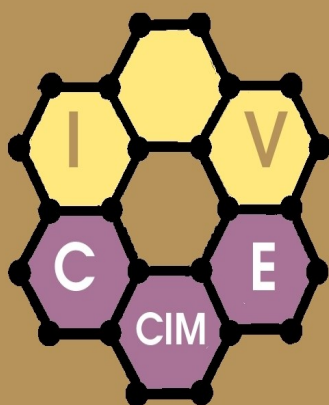




MEMORIAS

IV CONGRESO ESTATAL

DE CIENCIA E INGENIERÍA DE MATERIALES



Tultitlán, Estado de México

2, 3 y 4 de abril de 2025

Sesiones de Carteles (Poster Sessions)

- P-001.** *P.-Zumaya A. Daniel, Gutiérrez-Amador María P., Romero-Ibarra Issis C., Bravo-González, Edith, León-Nataret Y. A.,* Development of Nanosystems Based on Zinc Oxide Quantum Dots Functionalized With Noni Extract for Biomedical Applications.
- P-002.** *Olea Gutiérrez Abigail, Torres Mora Axel Damian, Cisneros Tamayo Ricardo,* Smart Garden for Crop Control.
- P-003.** *C. O. Hernández Chávez, J. Reyes Miranda, A. de Ita de la Torre, A. Garrido Hernández, O. Barrios Hernández,* Development and characterization of a light-weight high-entropy alloy MnNiCuAl for special applications.
- P-004.** *Mateos, Trinidad, Carlos Antonio, Suarez, Rosales, Miguel Ángel,* Effect of Heat Treatments on the Wear Resistance of Rotating Tools Made of H13, D2, and A11 Steels Used in Friction Stir Welding of Copper-Based Alloys.
- P-005.** *Cornelio Herrera Daniel, Corona Torres Vanessa, Galeana de la Cruz Areli, Laveaga Huanaco Wendy Evelyn, Medina León Nallely Montserrat, Pérez Vega Arturo, Plascencia Álvarez natalia.* Gestión de proyectos de un jardín polinizador.
- P-006.** *Cristian-Brayan Palacios-Cabrera,* Nanotecnología y Energías Renovables: Un Futuro Sostenible.
- P-007.** *Orozco Lopez Samanta Yatziry, Islas Sanchez Rosario, Cisneros Tamayo Ricardo, Fernández Retana Jorge,* System for volatile particle detection using MQ sensors and ESP32 microcontroller.
- P-008.** *López Arreola, Edgar, Suarez Rosales, Miguel Ángel , Torres Hernández, Yaret Gabriela, Beltrán Conde, Hiram Isaac, Altamirano Torres, Alejandro , Mateos Trinidad, Carlos Antonio.,* Evaluation of the mechanical properties of ASTM A36 steel after pack carburizing using sargassum as a carbon source.
- P-009.** *Calvillo Beltrán Sofía Valentina Rangel Ruíz Karelía Liliana, Arroyo Ordoñez Ivan, Granados Olvera y Jorge Alberto Jorge Alberto,* Antimicrobial activity of silver nanoparticles (agmps) from rosemary for application in crops impregnated with xanthomonas arboricola prunl.
- P-010.** *Guadarrama, Cruz, S., Gutiérrez, Amador, M.P., Romero, Ibarra, I., Díaz, Cano, A. I, Bravo, González, E, León Nataret, Y.A.,* Nanosystem of quantum dots/curcumin/magnesium to treat epileptic seizures.
- P-011.** *Santos Platero, Oliver Antonio, Reyes Miranda, Joan Garrido, Hernandez, Aristeo, Rea Castañares, Cecilia Jokebed, Hernandez Barrios, Fatima,* Experimental Study of the Hydrothermal Synthesis of NaYF₄ Doped with Yb³⁺ and Tm³⁺: Impact of pH and Surfactants.
- P-012.** *García Domínguez Giovanni, Gómez Ibarra María de Lourdes,* From nanomaterials to market: the rise of nanostartups.
- P-013.** *Kytzia S. S. Romero-Ibarra I. C., Canseco-Urbieta A., Bravo-González E., León-Nataret Y. A,* Transdermic patch for controlled release of nanodirected medicines for temporal lobe epilepsy.
- P-014.** *Molina Morales Mariana, Reyes Miranda Joan, Garrido Hernández Aristeo, Esteban Gatica Alondra Jaqueline, Barrios Hernández Oscar, Landa Castro Midori,* Manganese phosphate coatings on AISI 1018 steel sheets: influence of preparation conditions.
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- P-016.** *Medina Perez Natanael Enoc, Chavez Lopez Dulce Naivy, Garcia Garcia Cynthia, Sagaon Moreno Jorge Mario, León-Nataret Y. A.,* Manufacturing of a solar tracker based on SolarFlow and its operation.
- P-017.** *Abdiel Leonardo López-Martínez, Antonio Canseco-Urbieta, Rosa María Velasquez-Cueto, Yosemite Arjuna León-Naret,* Caracterización de Nanopartículas de Óxido de zinc.
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- P-019.** *Alcantar Pablo, Elizabeth, Vargas León, Enaim Aída, Vera Serna, Pedro, Garrido Hernández, Aristeo, García Domínguez, Giovanni,* Carmine acid adsorption from aqueous solution onto hydroxyapatite particles.
- P-020.** *Mata Solis Beatriz del Sagrario, García Domínguez, Giovanni, Vera Serna, Pedro, Chávez Güitrón, Lorena Elizabeth, Materno, Garrido Hernández Aristeo,* Formulation and toxicological evaluation of mononuclear eu-benzoic acid complexes in artemia salina.
- P-021.** *Fernández García, Misael Omar, Palacios Gómez, Jesús,* Heterogeneity of crystallographic texture as a function of depth in a silver sample using x-ray diffraction, using x-ray diffraction by weighing the intensities of a diffraction pattern.

- P-022.** *Martínez Hernández, Christian Miguel, Vera Serna, Pedro, Manríquez Ramírez, María Elena, Garrido Hernandez, Aristeo, García Domínguez Giovanni.* Development of a mathematical model based on tauc and urbach for estimating optical defects in zno nanoparticles.
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- P-026.** *Barraza-Fierro, Jesus Israel,* Construcción e interpretación de diagramas de Pourbaix en estabilidad de metales.
- P-027.** *Del Ángel Francisco Lesly Alabel, Vergara Reyes Hugo Yuriel, Rangel Ruíz Karelia, Granados Olvera Jorge Alberto,* Mycosynthesis and characterisation of silver nanoparticles from the fungus *Phytophthora infestans* with potential applications in the agroindustrial sector.
- P-028.** *Hernández Barrios Fátima, Santos Platero Oliver Antonio, García Domínguez Giovanni, Garrido Hernández Aristeo, Reyes Miranda Joan,* Effect of ultrasonic treatment on the dispersion, colloidal stability, and optical properties of NaEuF_4 particles.
- P-029.** *Carmona Álvarez Mariana Monserrat, Jimenez Ramirez Gerardo Aaron, Luna Arechiga Juan Francisco, Mares Manzo Mitzy Pamela, Sanchez Ortiz Hatzary Nicolette, Quinard Vidal José Luis,* Gestión biotecnológica de un biofertilizante a base de cáscaras de naranja y azotobacter.
- P-030.** *Colin-Nuncio, Jared Alejandro, González-Pedroza, María G., Díaz-Talamantes, César,* Evaluation of the antifungal activity of the biocomposite synthesized from Cu/MnO NP's and *cucumis sativus* seeds against the pathogenic fungus *fusarium oxysporum*.
- P-031.** *Pacheco Ortiz NY, León-Nataret YA, Díaz-Santiago IA, Velázquez Cueto RM, Canseco-Urbieta A,* Synthesis of polymeric nanoencapsulation with high molecular weight chitosan by the emulsion-diffusion method for its pharmaceutical application.
- P-032.** *León-Nataret Y. A.,* ¿Whats is a nanosystem? principles and applications in nanomedicine, nanoelectronics and environmental nanotechnology.
- P-033.** *Lorenzo-Galindo, Irving, Landa-Castro, Midori, Reyes-Miranda, Joan, Garrido-Hernández, Aristeo, Flores-Sanchez, Daniel,* Determination of the flow lines of a 1045 steel obtained by cold forging process.
- P-034.** *Rosales Figueroa, Danna Paola, Bravo-González E., León-Nataret Y. A.,* Nanoencapsulation of *aloe vera* with cellulose nanoclusters in a corn-cob-based cream with anti-aging properties.
- P-035.** *Vazquez Galindo, Martha Vanessa, Reyes Miranda, Joan, García Domínguez, Giovanni, Arredondo Martínez, Gabriela Verenice, Garrido Hernández, Aristeo,* Ultrasound-assisted dispersion of SrAl_2O_4 particles in aqueous medium: colloidal stability and optical properties.
- P-036.** *Arredondo Cardiel Viviana, Moran Velázquez Angelica Pamela, Rico Campos Leonardo Rafael, Altamirano García Liliana,* Obtención y evaluación de nanopartículas de hidróxido de calcio para restauración.
- P-037.** *Arroyo Ordoñez Ivan, Radilla Chávez Juan, González Torres Julio César,* Functional theory study of the density of arsenic adsorption by alumina nanoparticles for disposal in drinking water.
- P-038.** *Montiel Pineda, Yessica Jazmín, García Domínguez, Giovanni, Hernández Chávez, Christian Omar, Luna Urbina, Edgar, Garrido Hernández, Aristeo,* Fabrication and characterization of multilayer panels reinforced with carbon nanotubes.
- P-039.** *Aparicio Luna Yareth, Segura Salvador Aristeo, Leon-Nataret Y. A. Velázquez Cueto Rosa María, Canseco Urbieta Antonio,* Synthesis of *aloe vera*-based silver nanoparticles; evaluation of the potential antimicrobial effect.
- P-040.** *Luna Martínez, Mayra Margarita, Padilla, Martínez, Itzia I., García Báez, Efrén V., Narayanan, Jayanthi,* Covalent organic frameworks (cof) and metal-organic frameworks (mof) and some of their applications.
- P-041.** *Lomelí Ortiz Consuelo Esmeralda, Sánchez Huerta Daniel, López Perrusquia Noé, Flores Martínez Martin, Muhl Saunders Stephen,* Estudio superficial de la rugosidad y morfología de la aspereza de un recubrimiento bifásico de boro en un acero herramental.



DEVELOPMENT OF NANOSYSTEMS BASED ON ZINC OXIDE QUANTUM DOTS FUNCTIONALIZED WITH NONI EXTRACT FOR BIOMEDICAL APPLICATIONS.

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Abstract

In this study, a **multifunctional nanosystem** based on **zinc oxide quantum dots (ZnO QDs)**, functionalized with **ethanolic extract of noni (*Morinda citrifolia*)**, encapsulated in a **gelatin-based polymeric matrix**, and further functionalized with **folic acid** was successfully synthesized. The conjugation resulted in **nanoparticles (~8 nm)** exhibiting **bright blue fluorescence**, suitable for **bioimaging applications and optical diagnostics**. Encapsulation significantly enhanced the **chemical and structural stability**, preventing **aggregation** and ensuring **homogeneous distribution**. Finally, **folic acid functionalization** increased **specificity towards target cells**, boosting its **efficiency for controlled drug delivery**. This system represents a **significant advancement** towards **personalized therapies with theranostic potential**.

The **colloidal synthesis method** enabled the formation of **ZnO QD clusters** with **uniform size (~20 nm)**, characteristic **yellow fluorescence** due to **quantum confinement**, and a **crystalline structure** confirmed by **FTIR**, as evidenced by the **Zn–O bands in the 500–400 cm⁻¹ region**. Upon conjugation with the **ethanolic extract of *Morinda citrifolia* (noni)**, a **significant reduction in size (~8.36 nm)** was observed, along with a **fluorescence shift towards the blue range**, indicating **effective surface passivation** due to **interactions with bioactive compounds** present in the extract.

FTIR analysis confirmed the presence of **bands associated with the interaction** between **ZnO QDs and noni extract**, indicating **greater colloidal and chemical stability**. Encapsulation in gelatin facilitated the **formation of a homogeneous three-dimensional matrix**, preventing **nanoparticle aggregation** and ensuring **uniform distribution**—key properties for its **potential application in controlled drug delivery**.

Functionalization with folic acid was verified through an **increase in FTIR band intensity at 1640 cm⁻¹ and 1200 cm⁻¹**, confirming its **integration into the nanosystem** and its **potential for selective targeting of specific cells**, a crucial feature in **targeted therapies**.

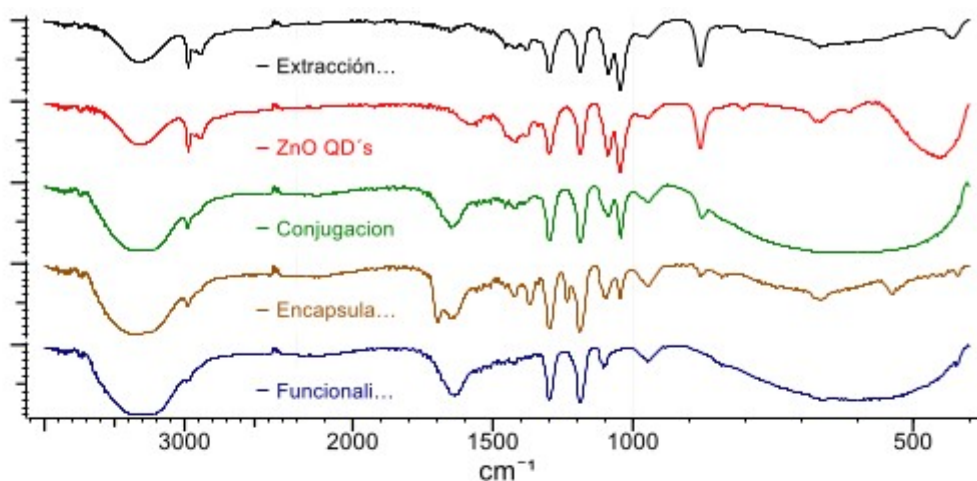


Figure 1. FTIR Spectra.

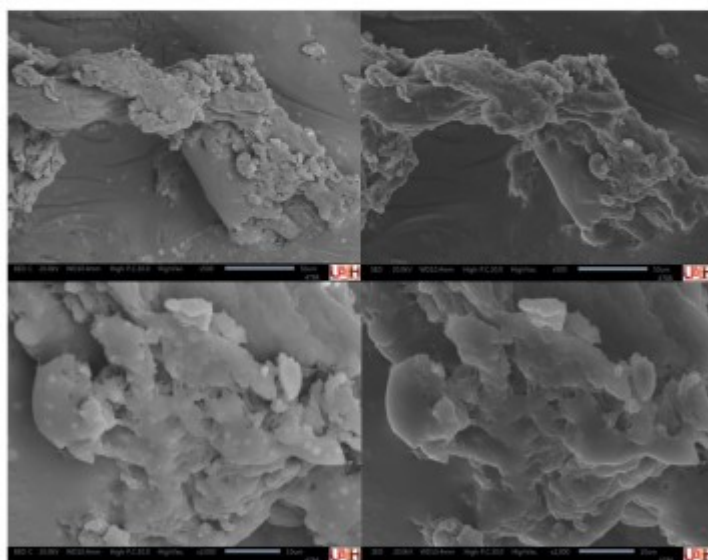


Figure 1. SEM Images.

A **multifunctional nanosystem** was successfully developed with applications in **diagnostics and targeted therapy**, distinguished by its **high biocompatibility** and **tunable optical properties**. Its **innovative design** positions it as a **promising candidate** for **theranostic nanomedicine**, with **potential applications** in **molecular diagnostics, personalized therapies, and controlled drug delivery**.

Key Words: ZnO QDs, Theranostics, Controlled drug release, Ethanolic noni extract, Gelatin, Folic acid, Nanomedicine.

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SMART GARDEN FOR CROP CONTROL

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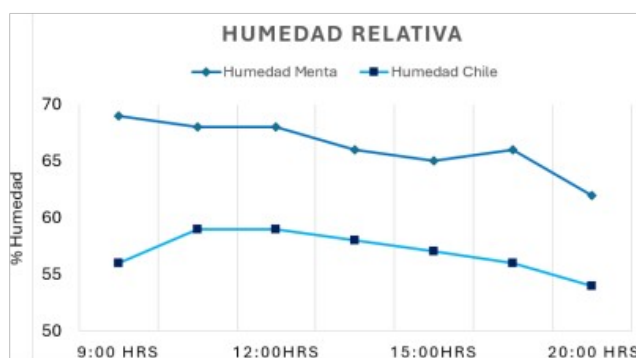
Abstract

The automation of a garden involves the application of technology to automate and control various aspects of a crop [1]. Agriculture is one of the most important activities for the economic and social development of communities. However, changing climatic conditions, limited water availability, and the need to optimize resource use have driven the development of new technologies to improve agricultural production [2].

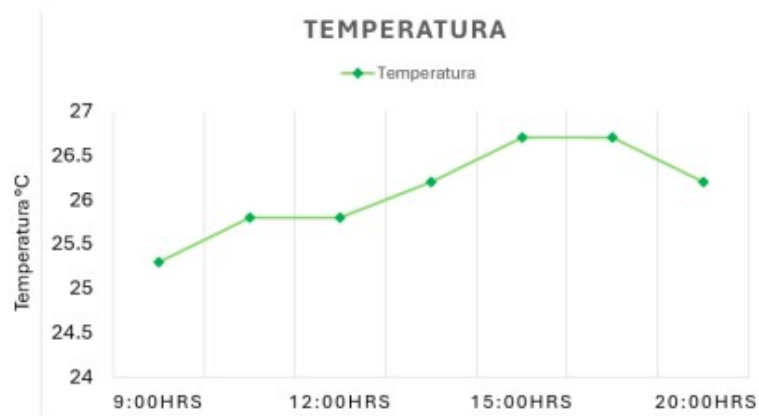
The goal is to develop an automated monitoring system using sensors to control humidity, light, and temperature in mint (*Mentha*) and habanero pepper (*Capsicum chinense*) crops. The installation of specialized sensors aims to collect real-time data on environmental conditions to ensure optimal plant growth [3].

The ability to customize growing conditions through sensors and automated systems allows the environment to be adapted to the specific needs of different types of plants, improving the efficiency and sustainability of agricultural production [4]. This project seeks to establish a technological foundation that can be replicated in other crops and agricultural areas, contributing to the strengthening of agriculture.

Key Words: Home automation, Sensors, Agriculture, Monitoring, Temperature, Humidity.



Graph 1 – Relative humidity results



Graph 2 – Temperature results



Figure 1 – Plant growth

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Development and characterization of a light-weight high-entropy alloy MnNiCuAl for special applications

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Abstract

To evaluate the mechanical properties of a light-weight HEA MnNiCuAl manufactured by oxy-fuel fusion at a temperature of 1500°C, followed by air cooling. The corresponding mixture calculations were performed, obtaining an entropy of 11.53/(J/Kmol), an enthalpy of -10.5/(kJ/mol), an atomic radius difference (δ) of 5.23, an interaction parameter (Ω) of 1.52, a valence electron concentration (VEC) of 7.75, and an electronegativity difference ($\Delta\chi$) of 0.164. Additionally, the alloy exhibited a density of 6.51 g/cm³, which is lower compared to steel. Based on the VEC and $\Delta\chi$ values, it was determined that the alloy forms a two-phase solid solution, consisting of FCC and BCC phases, which contribute high ductility and high mechanical strength, respectively, and contain intermetallic compounds. This was confirmed through X-ray diffraction and a metallographic process, where the representative microstructure showed the presence of two microconstituents: one dendritic and one interdendritic. Finally, microhardness tests were conducted at room temperature, reporting values between 390 and 410 HV.

Key Words: light-weight HEA, two-phase solid solution, atomic radius difference, interaction parameter, dendritic, interdendritic, low density.



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Effect of Heat Treatments on the Wear Resistance of Rotating Tools Made of H13, D2, and A11 Steels Used in Friction Stir Welding of Copper-Based Alloys

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Abstract

The objective of this work is to evaluate the wear resistance of steels used in the manufacturing of rotating tools for the Friction Stir Welding (FSW) process. Three different steels, H13, D2, and A11, were studied. These materials were subjected to quenching and tempering heat treatments to assess their performance compared to those without heat treatment. The steels were microstructurally characterized using optical microscopy, X-ray diffraction, and scanning electron microscopy. Mechanical characterization included hardness, microhardness, and wear tests under controlled conditions, followed by analysis with a profilometer and a stereoscope. The results show significant differences in wear resistance, influenced by the chemical composition of the steel and the applied heat treatments. H13 steel, although the most widely used in the industry [1-3], exhibited poor wear resistance compared to D2 and A11 steels, as shown in figure 1. Among the three steels studied, D2 steel demonstrated the best performance and greater dimensional stability of the tools, as observed in figure 2. These findings will help establish criteria for the proper selection of materials for manufacturing tools that improve service life and performance in friction stir welding applications.

Key Words: Friction Stir Welding, Wear Resistance, Adhesive Wear.

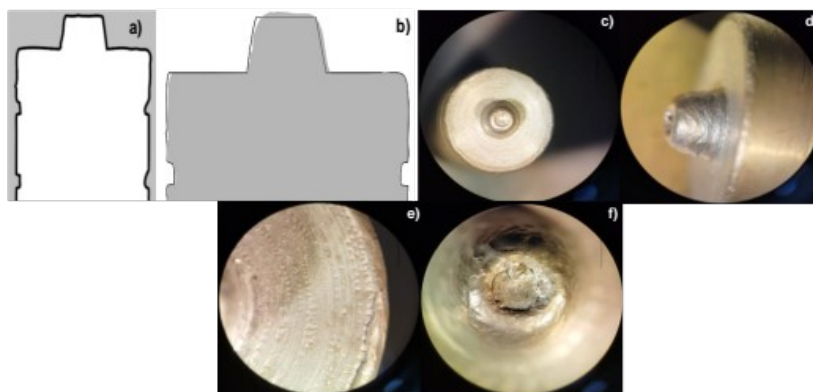


Figure 1. H13 steel tool tested at a rotational speed of 1120 rpm. a) Tool profile before the wear test. b) Worn tool profile overlaid with the reference tool profile. c) Worn contact surface observed under a stereoscope at 1X magnification. d) Worn tool pin, side view, observed under a stereoscope at 3X magnification. e) Worn tool shoulder observed under a stereoscope at 3X magnification. f) Worn tool pin, top view, observed under a stereoscope at 3X magnification.

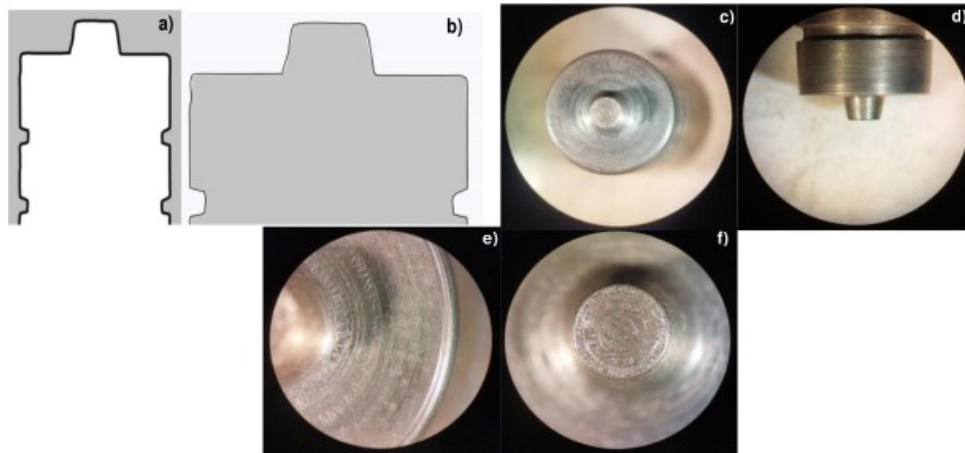


Figure 2. D2 steel tool tempered at 300°C tested at a rotational speed of 1120 rpm. a) Tool profile before the wear test. b) Worn tool profile overlaid with the reference tool profile. c) Worn contact surface observed under a stereoscope at 1X magnification. d) Worn tool pin, side view, observed under a stereoscope at 3X magnification. e) Worn tool shoulder observed under a stereoscope at 3X magnification. f) Worn tool pin, top view, observed under a stereoscope at 3X magnification.

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GESTIÓN DE PROYECTOS DE UN JARDÍN POLINIZADOR

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Abstract

One of the major current problems is the decline of pollinator populations, aggravated by the lack of awareness within the university community. To address this problem, we have developed a proposal to help counteract the negative impact of pollinator reduction.

The construction of a garden within the university not only seeks to create a visually attractive space, but also to provide a safe area where pollinators can feed and reproduce, thus helping to preserve them by using both native and phytoremediating plants, ensuring that they are not a danger to other species. In addition, the project integrates bioremediation strategies within the institution to improve environmental quality, applying the knowledge acquired throughout our academic training. Within this project we suggest the use of plants such as *Lavandula* and *Phragmites australis*.

Key words: pollinator, reproduce, bioremediation, garden.



Figure 1. *Lavandula*
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Figure 2. *Phragmites australis*.
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Nanotecnología y Energías Renovables: Un Futuro Sostenible

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La nanotecnología está transformando radicalmente el panorama de las energías renovables, ofreciendo soluciones innovadoras que mejoran significativamente la eficiencia, durabilidad y rentabilidad de los sistemas energéticos sostenibles. En el campo de las celdas solares de nueva generación, los avances nanotecnológicos han permitido superar las limitaciones del silicio convencional. Los puntos cuánticos y las perovskitas nanoestructuradas están alcanzando eficiencias cercanas al 30%, captando un espectro más amplio de luz solar. Los materiales como CIGS y CdTe permiten fabricar paneles solares flexibles y ligeros, adaptables a superficies no convencionales[1, 2]. Los recubrimientos nanométricos antirreflectantes y autolimpiantes aumentan la absorción de luz y reducen el mantenimiento, optimizando el rendimiento fotovoltaico. Para la energía eólica, los recubrimientos nanoestructurados resistentes a la erosión prolongan la vida útil de las palas de aerogeneradores hasta un 25%, manteniendo sus propiedades aerodinámicas óptimas incluso en condiciones adversas. La incorporación de nanoaditivos en materiales compuestos resulta en estructuras más ligeras pero resistentes, permitiendo la construcción de turbinas más grandes y eficientes. Los nanosensores integrados en componentes críticos proporcionan monitorización en tiempo real, facilitando el mantenimiento predictivo y aumentando la eficiencia operativa aproximadamente un 15%. En el almacenamiento energético, los ánodos nanoestructurados de silicio-carbono para baterías de iones de litio ofrecen capacidades hasta tres veces superiores a los convencionales, mientras que los cátodos nanométricos de fosfato de hierro-litio mejoran la seguridad y longevidad[3, 4]. Los supercondensadores con electrodos de grafeno y nanotubos de carbono alcanzan densidades energéticas récord con tiempos de carga ultrarrápidos, ideales para aplicaciones que requieren respuesta instantánea en redes eléctricas inteligentes. La energía hidroeléctrica se beneficia de recubrimientos DLC (Diamond-Like Carbon) que reducen la fricción en turbinas hasta un 40%, aumentando la generación eléctrica con el mismo flujo de agua[4, 5]. Los óxidos metálicos nanoestructurados proporcionan protección superior contra la corrosión y cavitación, extendiendo significativamente la vida útil de los equipos y reduciendo costos operativos. Los sensores nanométricos permiten monitorizar en tiempo real la calidad del agua y las condiciones operativas, optimizando el rendimiento mientras se minimizan los impactos ambientales[6]. En la energía geotérmica, los nanofluidos con partículas metálicas en suspensión aumentan la transferencia térmica hasta un 60%, permitiendo aprovechar económicamente yacimientos de menor temperatura[7]. Las

nanoespumas aislantes reducen las pérdidas térmicas en sistemas de transporte de calor, mientras que los recubrimientos especializados protegen los equipos en ambientes geotérmicos extremadamente corrosivos, ampliando la viabilidad económica de proyectos en regiones previamente consideradas marginales[8]. Para la producción de hidrógeno verde, las nanomembranas catalíticas de óxidos metálicos mixtos incrementan la eficiencia de electrólisis hasta un 90%, reduciendo significativamente la energía requerida. Los fotocatalizadores nanoestructurados permiten la ruptura directa de agua mediante luz solar, mientras que los nanocatalizadores avanzados mejoran el rendimiento de las celdas de combustible, optimizando tanto la producción como el uso del hidrógeno como vector energético limpio[9]. En conjunto, estas innovaciones nanotecnológicas están catalizando una transformación profunda en el sector energético renovable, proporcionando soluciones a muchos de los desafíos técnicos y económicos que han limitado su adopción masiva. La sinergia entre nanotecnología y energías renovables acelera la transición global hacia un sistema energético más limpio, eficiente y sostenible para las generaciones futuras[10, 11].

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SYSTEM FOR VOLATILE PARTICLE DETECTION USING MQ SENSORS AND ESP32 MICROCONTROLLER

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Abstract.

This project develops a volatile particle detection system using MQ series sensors and the ESP32 microcontroller. MQ sensors operate through variations in their electrical resistance and were calibrated to detect gases such as alcohol, carbon monoxide, and methane. The integration of the ESP32 enabled sensor connectivity and real-time data processing for measurement analysis.

The system design included PCB fabrication, ESP32 programming, and validation through Proteus simulation and experimental testing. Results demonstrated the system's effectiveness in monitoring volatile compounds, aligning with the manufacturer's specifications.

This system represents a viable solution for environmental monitoring applications in future developments.

Key words: MQ sensors, ESP32, volatile particle detection, PCB, environmental monitoring, gas detection.

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“Evaluation of the mechanical properties of ASTM A36 steel after pack carburizing using sargassum as a carbon source”

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Abstract

Pack carburizing is a process in which low-carbon steel is exposed to an atmosphere rich in CO and CO₂ within a temperature range of 850 to 950°C. Under these conditions, carbon diffusion into the steel's surface is facilitated. Following a heat treatment involving quenching and tempering, the result is a material with a hardened surface and a ductile, tough core. To generate a carbon-rich atmosphere, the steel is immersed in a mixture containing alkaline earth metal carbonates and carbon sources. Traditionally, graphite and charcoal are employed in this mixture. However, recent studies have proposed replacing conventional materials with organic waste, thus providing an opportunity to utilize these by-products. Figure 1 illustrates the microstructure of ASTM A36 steel, displaying the carbon-rich layer present in the material.

Keywords: Pack Carburizing, Sargassum, ASTM A36 Steel.

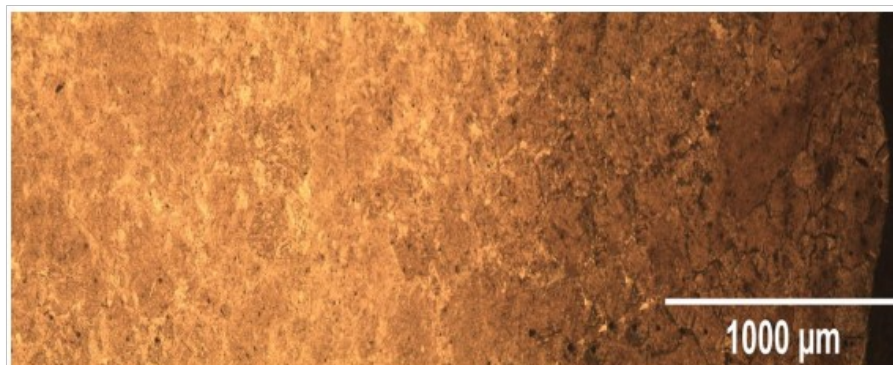


Figure 1 – Microstructure of ASTM A36 steel subjected to a pack carburizing process using calcined sargassum as a carbon source.

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ANTIMICROBIAL ACTIVITY OF SILVER NANOPARTICLES (AGNPS) FROM ROSEMARY FOR APPLICATION IN CROPS IMPREGNATED WITH *XANTHOMONAS ARBORICOLA PRUNI*

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Abstract

Xanthomonas arboricola pruni is a phytopathogenic bacterium that infects fruit crops such as peach, apricot, plum, and almond, causing significant damage to agricultural production. Conventional treatments, such as bactericides, antibiotics, and copper compounds, have led to bacterial resistance and environmental contamination. Therefore, silver nanoparticles (AgNPs) manufactured through green synthesis represent a promising alternative due to their antimicrobial activity and lower environmental impact. This research aims to evaluate the antimicrobial activity of AgNPs synthesized from a rosemary (*Rosmarinus officinalis*) extract against *X. arboricola pruni* in apricot (*Prunus armeniaca*) fruit crops using different methodologies and parameters.

Following the synthesis and characterization of AgNPs, infected leaves were collected from fruit orchards and processed using isolation techniques and seeding in culture media. Purification and pathogenicity tests were then performed on the bacteria to ensure the bacteria were in good condition and to be able to use antibiograms and microbial assays to evaluate the effectiveness of AgNPs in eradicating the bacteria from crops.



Figure 1. *X. arboricola pruni* in apricot plant

For the antimicrobial evaluation, the Kirby-Bauer test was performed using different concentrations of AgNPs on the discs to measure inhibition zones compared to those of conventional treatments such as the commercial bactericide Kasumin. Following this analysis, the lowest concentration capable of inhibiting and killing the bacteria was determined through assays in nutrient broth and reseeded on agar. Various staining techniques were subsequently performed to evaluate morphological changes in *X. arboricola* following treatment with AgNPs.



Figure 2. Culture of the bacteria to perform the inhibition test



Figure 3. Strain to confirm the methodology

Once the various tests were performed in the laboratory, the AgNPs were applied to some infected leaves collected from the orchards, and growth or inhibition parameters were measured.



Figure 4. AgNPs applied to the infectious test



Figure 5. Infected test without AgNPs

The inhibition zone results were significantly higher on the discs impregnated with AgNPs compared to conventional treatments such as pesticides. No adverse effects on plant growth or development were observed in pathogenicity tests. Meanwhile, infected plants showed optimal recovery after treatment.

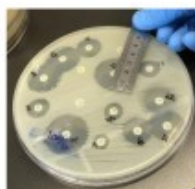


Figure 6. Inhibition of the bacteria using AgNPs

AgNPs synthesized from rosemary extract demonstrated potent antimicrobial activity against *X. arboricola pruni*, surpassing conventional treatments in efficacy. Green synthesis produced nanoparticles with excellent stability and biocompatibility, reducing environmental impact and eliminating the need for harsh chemicals. This improved the quality of fruit for public consumption and prevented the need to cut down orchards infected with the pest due to its resistance to conventional methods.

Key Words: Silver Nanoparticles, Inhibition, Bacteria, Efficacy, Biocompatibility

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NANOSYSTEM OF QUANTUM DOTS/CURCUMIN/MAGNESIUM TO TREAT EPILEPTIC SEIZURES.

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Abstract

In Mexico City, large amounts of food waste, including onion residues, can be better utilized. Carbon quantum dots (CQDs) were obtained from these residues. CQDs have several applications due to their biocompatibility, resistance to photodegradation, and notable fluorescence. For instance, CQDs aim to control the ionic flow between cells by inactivating certain channels, which are relevant for treating diseases influenced by genetic factors, structural injuries, or cellular alterations. Using microwave-assisted green synthesis, CQDs with curcumin and magnesium were synthesized to develop a new epilepsy treatment. Morphological and topographical analyses of the samples were conducted using SEM, and particle size distribution was calculated. Structural analysis with XRD identified the diffraction peaks of the nanomaterials, and the crystallite size was calculated using the Debye-Scherrer equation. Additionally, FTIR identified the functional groups of the samples, and UV-vis observed the absorbance curves of the chemical precursors (onion, curcumin, and magnesium citrate) and the nanosystem.

Key Words: CQDs, curcumin, magnesium, epilepsy.

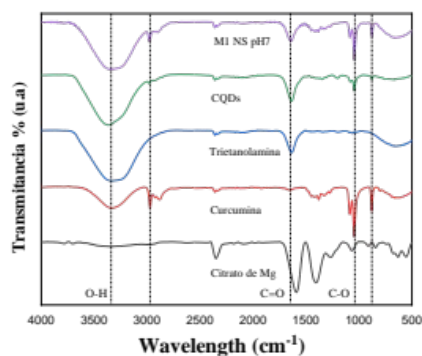


Table 1 – FTIR spectra of M1, CQDs, triethanolamine, curcumin, and magnesium citrate.

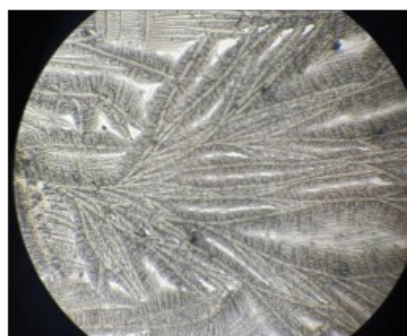


Table 1 – EDS of M1 CQDs/curcumin/magnesium at pH 7.

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Experimental Study of the Hydrothermal Synthesis of NaYF₄ Doped with Yb³⁺ and Tm³⁺: Impact of pH and Surfactants

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Abstract

In this work, the hydrothermal synthesis of NaYF₄ doped with Yb³⁺ and Tm³⁺ is presented, evaluating the effect of surfactants (CTAB and SDS) and pH (8 and 10) on nanoparticle morphology and size. A 2³ factorial design was employed, using ethylene glycol as a cosolvent, with synthesis times of 24 hours at 180 °C. The precursors (Y₂O₃, Yb₂O₃, and Tm₂O₃) were converted into chlorides using 2M HCl, and NaF was dissolved in a mixture of water and ethylene glycol in equal proportion. The obtained powders were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and energy-dispersive spectroscopy (EDS). XRD results confirmed the formation of the hexagonal β-NaYF₄ phase with average crystallite sizes of 36.04 nm for the control sample, while doping with Yb³⁺ (20%) and Tm³⁺ (1.5%) reduced the size to 28.68 nm. The SDS surfactant caused a further reduction (21.78 nm at pH 10), while the use of CTAB maintained larger sizes (28.59 nm at pH 10 and 26.41 nm at pH 8). FTIR analysis showed surfactant residues in samples treated with SDS (sulfate band at 1162 cm⁻¹) and with CTAB (ammonium group band at 1551 cm⁻¹), as well as ethylene glycol residues in some samples. SEM images revealed anisotropic needle-like structures with CTAB and spherical particles with SDS. The average particle size was 74.59 nm in the sample doped with 20% Yb³⁺ and 1.5% Tm³⁺, pH 10 and CTAB. EDS analysis confirmed the homogeneous incorporation of Yb³⁺ and Tm³⁺ dopants into the NaYF₄ matrix. The use of surfactants and pH variation in the synthesis allows adjusting the particle size and morphology for optical and photonic applications.

Key Words: Hydrothermal Synthesis, Nanoparticle, Surfactants (CTAB, SDS), Anisotropic Structures,



FROM NANOMATERIALS TO MARKET: THE RISE OF NANOSTARTUPS

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Nanotechnology is no longer solely a field of research it has become a platform for innovation with high potential for economic and social impact. This presentation explores the rise of nanostartups: technology based ventures that transform knowledge about nanomaterials into applied solutions across sectors such as health, energy, smart coatings, electronics, and biomaterials.

It will provide an overview of current opportunities within the nanotechnology innovation ecosystem, as well as the main challenges faced by scientific entrepreneurs when bringing their developments from the lab to the market. Key strategies for creating viable business models, funding mechanisms, and inspiring success stories will also be addressed, highlighting the shift toward an entrepreneurial mindset in applied science.

This talk aims to inspire students, researchers, and educators to consider technology-based entrepreneurship as a powerful means of knowledge transfer fostering the creation of scientific startups from within academic environments, especially in the field of advanced materials.

Key Words: Nanotechnology, Scientific Entrepreneurship, Nanomaterials, Technology Transfer, Deep Tech Startups



TRANSDERMIC PATCH FOR CONTROLLED RELEASE OF NANODIRECTED MEDICINES FOR TEMPORAL LOBE EPILEPSY.

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Abstract

Temporal lobe epilepsy (TLE) is a neurological disorder characterized by recurrent seizures that often resist conventional therapies. Recent advancements in nanotechnology offer promising alternatives to enhance drug delivery for epilepsy management. This written project explores the development of a fisetin-based therapeutic system utilizing nanostructured lipid carriers (NLCs) combined with chitosan for targeted and sustained drug release. Fisetin, a natural flavonoid with neuroprotective and anti-inflammatory properties, is encapsulated in the lipid matrix to improve its bioavailability and stability. Chitosan, a biocompatible polymer, is integrated as a surface modifier to enhance mucoadhesion and crossing of the blood-brain barrier [1-3].

The NLC formulation exhibits high encapsulation efficiency, controlled release kinetics, and biocompatibility, as demonstrated in in vitro and in vivo models. Preliminary results indicate that fisetin-loaded NLCs effectively reduce seizure frequency and severity in animal models of TLE. Furthermore, the combination of lipid carriers and chitosan ensures targeted delivery to the epileptogenic zones, minimizing systemic side effects. This novel approach could revolutionize the treatment landscape for drug-resistant epilepsy, providing a foundation for further clinical development [4-6].

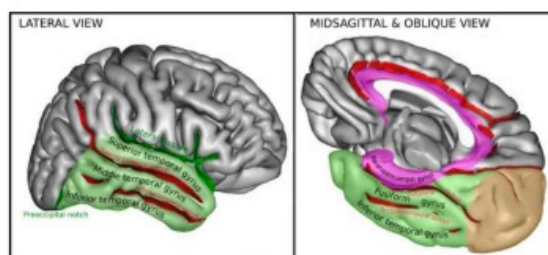


Figure 1: Parts of the temporal lobe.

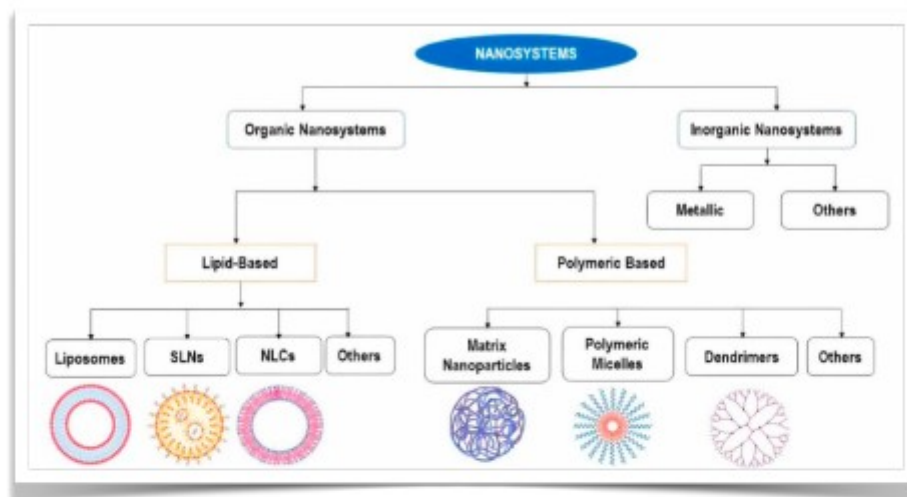


Figure 2: Classification of nanocarriers systems for the treatment of epilepsy.

Key Words: TLE, drug delivery, nano systems, NLCs, biocompatibility.

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MANGANESE PHOSPHATE COATINGS ON AISI 1018 STEEL SHEETS: INFLUENCE OF PREPARATION CONDITIONS

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Abstract

This work explores the effect of the chemical conversion synthesis parameters on the development and performance of manganese phosphate coatings applied to AISI 1020 steel substrates. Manganese oxide (MnO) and manganese chloride (MnCl₂) were employed as precursor sources, with metal concentrations of 3 and 4 g·L⁻¹ and pH levels adjusted to 3 and 5. The coating process was conducted at a constant temperature of 85-90 °C for 30 minutes.

X-ray diffraction (XRD) analysis confirmed the formation of hureaulite, a crystalline manganese phosphate phase. Scanning electron microscopy (SEM) revealed predominantly uniform coatings composed of well-defined, faceted phosphate grains. Coating thickness, assessed using a Positector 6000, demonstrated significant dependence on pH. Statistical analysis using ANOVA identified the pH as the most influential factor.

Electrochemical evaluation of corrosion behavior indicated that the most favorable coating performance was obtained when manganese oxide was used as the precursor. These conditions led to enhanced coating integrity and improved corrosion resistance.

Keywords: Manganese phosphate, pH, Vickers hardness, hureaulite.

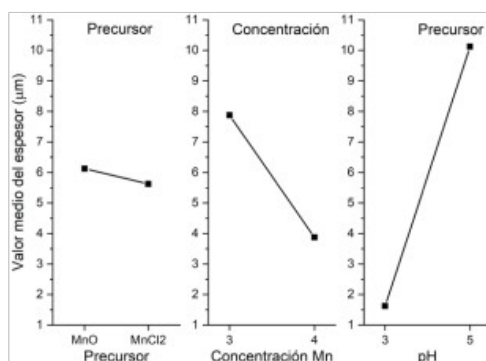


Fig. 1 Main effects plot of the factors on the coating thickness.

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FUNCTIONALIZATION OF MULTI-WALLED CARBON NANOTUBES FOR THE DEVELOPMENT OF REINFORCED COMPOSITE MATERIALS

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Abstract

This work presents the functionalization of multi-walled carbon nanotubes (MWCNTs) as a strategy for the development of reinforced composite materials with enhanced properties. Due to their high mechanical strength and excellent thermal and electrical capabilities, MWCNTs represent an ideal reinforcement for polymer matrices. However, their limited dispersion and low surface compatibility hinder their efficient integration into composite systems.

To overcome these limitations, chemical treatments using acids (HCl and HNO₃) and surfactants (SDS), combined with ultrasonic sonication, were applied to improve dispersion and colloidal stability. Experimental designs were established considering different concentrations of nanotubes and functionalizing agents. FT-IR spectroscopy characterization confirmed the incorporation of functional groups without affecting the core structure of the MWCNTs. Likewise, optical microscopy analysis revealed that SDS treatments offered a more homogeneous distribution within the polymer matrix compared to acidic treatments.

The resulting composite materials showed notable improvements in translucency, reduced agglomeration, and increased system stability. These findings validate the functionalization of MWCNTs as an effective technique for developing advanced coatings and composite materials with potential applications in the automotive, aerospace, electronics, and biomedical sectors.

Key Words: Multi-walled carbon nanotubes (MWCNTs), functionalization, composite material, ultrasonic dispersion, colloidal stability



Manufacturing of a solar tracker based on SolarFlow and its operation

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Abstract: The objective of this project is to develop a solar tracker called "SolarFlow". This device was designed using a photovoltaic panel and motor that enables tracking of solar radiation. To ensure efficient energy storage, a next-generation battery was proposed incorporating nanotechnology. The goal is to use zinc oxide nanowires, manganese nanoparticles, and reduced graphene oxide to create materials with high energy storage efficiency. SolarFlow has the ability to orient itself toward the area with the highest solar radiation, positioning the photovoltaic panel in the optimal direction throughout the day. Future work will focus on constructing the nanotechnology-based battery, making it lighter and reducing its weight to improve motor efficiency

Key Words: Solar radiation, Nanotechnology, Energy storage, High-efficiency materials and Photovoltaic panel

Figure 1 –
Solar
panel



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Types of solar tracking, light sensors, nanotechnology, motors, power circuits, solar panel, Solar radiant and energy storage taerf (Times, 10, Justified)

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Caracterización de Nanopartículas de Óxido de zinc

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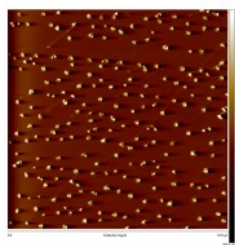
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Palabras clave: Síntesis, espectrofotometría UV-Vis, microscopía de fuerza atómica.

INTRODUCCIÓN

Las nanopartículas son materiales que pueden definirse como partículas cuyo tamaño va desde 100-10 nm (1). La forma puede variar dependiendo de su elaboración, siendo muchos los factores a tomar en cuenta, entre ellos los precursores de síntesis, la temperatura, los solventes y estabilizadores usados en la reacción. Los polvos nanocristalinos pueden llegar a tener diferentes comportamientos dependiendo de la forma que tengan sus partículas, lo que eleva el número de usos potenciales de las nanopartículas. El ZnO es un material de bajo costo, con una baja toxicidad y muy buena capacidad de absorción de los rayos UV, volviéndolo muy bueno en la protección contra la luz solar(2). Existe una amplia variedad de métodos de síntesis que pueden ser empleadas en la elaboración de este material. El tamaño de las nanopartículas y su morfología puede ser ajustado por medio de métodos químicos y físicos (3). En especial las nanopartículas de ZnO son utilizadas por sus propiedades antimicrobianas en distintas industrias como la textil, alimenticia, médica, cosmética y de aguas (4).



a)



b)

Figura 2. a)Imagen obtenida con el MFA de las nanopartículas de ZnO montadas en sustrato de HOPG. b) análisis de la sección transversal medida de 134 nm

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Jabón biodegradable a partir de aceite quemado

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En la actualidad, el aceite de cocina usado se descarta sin restricciones, siendo el agua su destino principal, lo que conlleva a la contaminación y complica su tratamiento con métodos convencionales. Por consiguiente, se propone la utilización de este aceite para la producción de detergentes asequibles a través de un proceso químico que facilite su incorporación al entorno ambiental. Por lo tanto, el objetivo del presente trabajo es reducir la huella ecológica del aceite quemado mediante un proceso que permita la obtención de detergentes de bajo costo. Así como también obtener las proporciones de Aceite-Catalizador a utilizar, establecer las condiciones de reacción, Estabilizar el pH del producto obtenido de la reacción y realizar pruebas de limpieza a los detergentes producidos

El proceso inicia con la recolección del aceite usado, proveniente de los hogares de los alumnos y de un establecimiento de comida. Posteriormente, se traslada a un recipiente de acero inoxidable y se calienta a una temperatura específica de 190-200 °C hasta alcanzar el punto de ebullición. A continuación, se introduce sosa cáustica y al mezclar, se forma una pasta que servirá como base para la elaboración del jabón. Esta pasta se diluye en agua para disolver los sólidos y luego se ajusta el pH utilizando ácido sulfúrico o ácido clorhídrico. Para finalizar, se añaden esencias, colorantes, dependiendo del tipo de detergente deseado. y un estabilizador para completar el proceso de fabricación del jabón.

El aceite de cocina quemado resultó ser una fuente importante de materia prima para la producción de detergentes. Los detergentes producidos presentan cualidades de limpieza que se asemejan a los detergentes de marcas reconocidas. Por cada 5L de aceite quemado, es posible obtener 20 L de la base para el jabón.

Al reutilizar el aceite de cocina usado para hacer detergentes, se reduce la cantidad de residuos, se conservan los recursos y se promueve la conciencia ambiental. Esta iniciativa apoya el reciclaje creativo y tiene un impacto positivo en la mejora del entorno.



CARMINE ACID ADSORPTION FROM AQUEOUS SOLUTION ONTO HYDROXYAPATITE PARTICLES

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Abstract

The presence of organic dyes in industrial wastewater represents a serious environmental issue due to their high chemical stability, toxicity, and resistance to conventional treatment processes. In this context, the development of efficient, low-cost, and environmentally friendly adsorbent materials is urgently needed. In this study, hydroxyapatite (HA) particles were synthesized via precipitation method to evaluate their potential as adsorbents for organic compounds in aqueous solution.

Structural characterization by X-ray diffraction (XRD) confirmed the formation of a hexagonal crystalline phase corresponding to hydroxyapatite, according to ICDD card 09-0432. Fourier-transform infrared spectroscopy (FT-IR) revealed no evidence of secondary phases, indicating high material purity. Morphological analysis by scanning electron microscopy (SEM) showed a homogeneous distribution of particles, while thermogravimetric analysis (TGA) was used to assess thermal stability.

Carmine acid (CA), a dye widely used in the food, textile, and cosmetic industries, was selected as a model contaminant. The Langmuir isotherm model adequately described the adsorption behavior, indicating monolayer formation on the HA surface. The synthesized particles achieved a maximum adsorption capacity of 82 mg/g at room temperature. These results highlight hydroxyapatite as an efficient, sustainable, and cost-effective adsorbent for the removal of organic dyes from industrial effluents.

Key Words: hydroxyapatite, hydrothermal synthesis, adsorption, carmine acid, wastewater treatment.



FORMULATION AND TOXICOLOGICAL EVALUATION OF MONONUCLEAR Eu-BENZOIC ACID COMPLEXES IN ARTEMIA SALINA

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Abstract

In this study, the toxicity of mononuclear europium–benzoic acid complexes was evaluated using *Artemia salina*, a widely used model in ecotoxicological bioassays. The complexes were synthesized through two different routes, employing europium chloride and europium nitrate as precursors [1]. These complexes were then dispersed in aqueous solutions at different concentrations (10, 100, and 1000 ppm) to assess their impact on *Artemia salina* viability at 24 and 48-hour intervals.

The results demonstrated that the toxicity of the complexes depended on both concentration and exposure time. At low concentrations (10 ppm), minimal mortality was observed in both synthesis routes. However, at high concentrations (1000 ppm), significant differences were detected. The complex synthesized from europium chloride showed a decrease in mortality after 24 hours, whereas the europium nitrate-based complex maintained a higher but more stable mortality rate over time.

These findings suggest that the choice of europium precursor influences the toxicity of the complexes, emphasizing the need to evaluate their potential biological and technological applications before widespread use.

Key Words: Europium complexes, artemia salina, ecotoxicology, luminescent materials.

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HETEROGENEITY OF CRYSTALLOGRAPHIC TEXTURE AS A FUNCTION OF DEPTH IN A SILVER SAMPLE USING X-RAY DIFFRACTION, USING X-RAY DIFFRACTION BY WEIGHING THE INTENSITIES OF A DIFFRACTION PATTERN.

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Abstract

Studies of superconductors [1] revealed the importance of a substrate with a predominant and homogeneity texture. In metals, texture depends on the fabrication process [2], particularly for those involving rolling, a texture gradient is to be expected at different depths.

For this study, a silver plate was prepared by rolling and annealing in several steps. The texture of this plate at different depths was obtained by X-ray diffraction patterns.

Integrated intensities of XRD patterns were analyzed by a technique that weighs the intensity of the peaks [3], revealing the preferential orientation of crystallographic planes by a normalized parameter. A previous study [4] near the surface didn't reveal any tendency in depths less than 100 μm . EBSD analysis of this sample reveals a different texture and grain size at middle of the thickness, XRD patterns were obtained at 6 different depths (0 μm , 60 μm , 120 μm , 170 μm , 220 μm and 270 μm). SiC sandpaper was used for grinding the plate.

Analysis revealed a change in the texture parameter as a function of depth showing a preference for (220) planes for all depths. Additionally, it was discovered that for greater depths the texture parameter doubles its value in comparison to the surface.

Keywords: EBSD, silver, texture, XRD

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DEVELOPMENT OF A MATHEMATICAL MODEL BASED ON TAUC AND URBACH FOR ESTIMATING OPTICAL DEFECTS IN ZnO NANOPARTICLES

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Abstract

The present study developed an empirical mathematical model to estimate the relative density of structural defects in zinc oxide (ZnO) nanoparticles synthesized by the hydrothermal method. The analysis was based on results obtained from UV-visible spectroscopy, complemented by morphological characterization using Scanning Electron Microscopy (SEM) and structural analysis through X-ray Diffraction (XRD). The model was built upon UV-visible absorption spectra and Tauc plot analysis, establishing a relationship between the optical bandgap energy and the nanoparticle length-to-diameter (L/D) ratio. The results indicate that more elongated particles exhibit a lower bandgap, suggesting a decrease in quantum confinement and/or an increase in crystalline defects.

Using this relationship, a second model was formulated to estimate the relative defect density (D_{rel}) based on the bandgap shift from the theoretical value of pure ZnO (3.37 eV). These models enable a quantitative correlation between the morphological, optical, and structural parameters of ZnO, providing a useful tool for predicting defect levels from UV-Vis analysis without the need for more expensive techniques.

Key Words: Zinc oxide nanoparticles, structural defects, UV-Visible spectroscopy, bandgap energy, empirical modeling.



USE OF SILVER NANOPARTICLES SYNTHESIZED BY A GREEN CHEMISTRY METHOD FOR THE OPTICAL DETECTION OF DOPAMINE IN REAL SAMPLES.

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Abstract

Dopamine is a vital component in human metabolism and causes neurodegenerative diseases such as schizophrenia, epilepsy, and hyperactivity disorder, if present in abnormal concentrations. Therefore, dopamine determination in real samples using selective sensors is essential. In this work, an optical sensor for dopamine detection was developed based on silver nanoparticles (Ag NPs) obtained by a green chemistry method, using *Origanum vulgare* as a reducing agent. The Ag NPs were characterized by UV-vis, achieving the absorption peak at 438 nm, confirming the presence of Ag NPs in the sample. Various Ag NP samples were synthesized using a unique *Origanum vulgare* extract, ensuring the reproducibility and repeatability of the process. The Ag NPs were exposed to different concentrations of dopamine, where it was developed that there was a relationship between the concentration and the absorbance peak, as well as a relationship between the color and the concentration of dopamine, these results allowed establishing a detection limit lower than that reported in the literature. Likewise, RGB software was used to interpret color changes across different dopamine concentration ranges, verifying the ability of Ag NPs to act as an optical sensor for detecting the neurotransmitter. This new sensor was applied to detect dopamine in human urine samples, successfully detecting its presence even in complex samples. Therefore, Ag NPs are considered an innovative, efficient, and cost-effective sensor that allows for early and accurate monitoring of dopamine levels.

Key Words: Ag NPs, Dopamine, Green chemistry, Optical sensor, Human Urine.

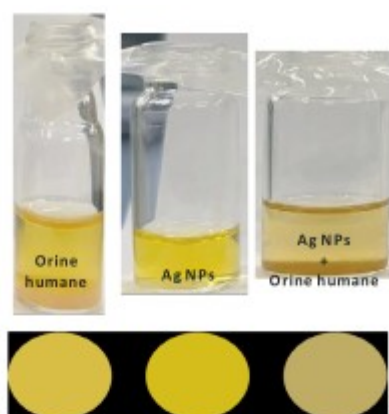


Figure 1 - Human urine samples Ag NPs and Ag NPs + human urine.
Own Elaboration.

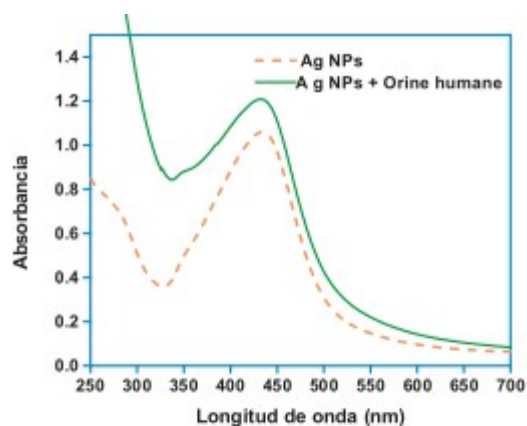


Figure 2 – Ag NPs absorbance and Ag NPs absorbance indicator + human urine.
Own Elaboration.

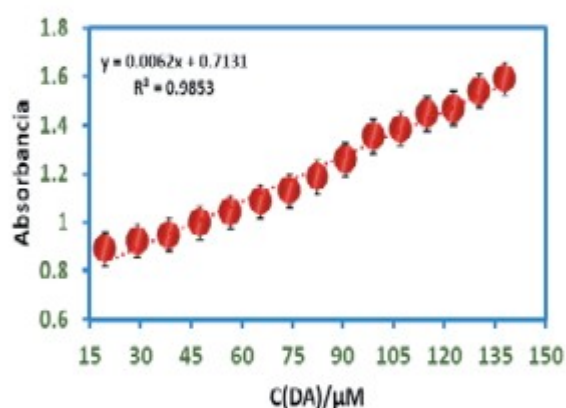


Figure 3 – DA concentration vs. Ag NPs absorbance.
Own Elaboration.

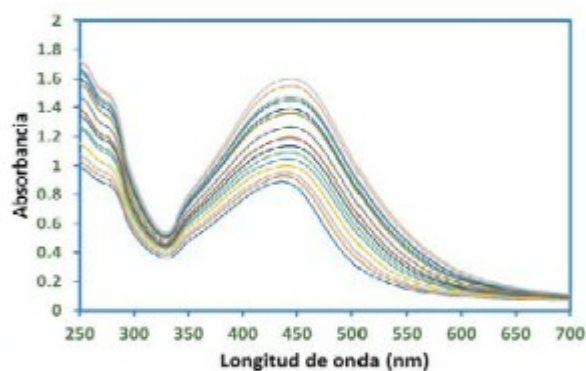


Figure 4 – Absorbance of Ag NPs at different DA concentrations.
Own Elaboration.

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DETECCIÓN ELECTROQUÍMICA DE DOPAMINA USANDO UN NUEVO ELECTRODO BASADO EN NANOMATERIALES

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Abstract

La dopamina (DA) y el ácido úrico (AU), componentes vitales del metabolismo humano, causan diversos problemas de salud si se encuentran en concentraciones alteradas¹; por lo tanto, la determinación de DA y AU es esencial en muestras reales mediante sensores selectivos. En el presente estudio, se fabricaron electrodos de pasta de carbono de grafito (CPE) utilizando puntos cuánticos de carbono/ZnO/ (ZnO/CQD) y se emplearon como sensores electroquímicos para la detección de DA. Estos electrodos se caracterizaron completamente mediante diferentes técnicas analíticas (DRX, SEM, TEM, XPS y EDS). Las respuestas electroquímicas de los electrodos modificados se evaluaron mediante voltamperometría cíclica, voltamperometría de onda cuadrada y espectroscopia de impedancia electroquímica. Los resultados mostraron que el electrodo actual ha exhibido una alta sensibilidad hacia la DA, reconociéndola incluso a bajas concentraciones (0.12 μM), y no se observó interferencia en presencia de AU. El electrodo ZnO/CQD se aplicó para la detección simultánea de DA y AU coexistentes en muestras reales de orina humana. Se observó que la separación del potencial de pico entre DA y AU estaba estrechamente relacionada con el efecto sinérgico del ZnO y los CQD. Se analizó el límite de detección (LOD) del electrodo y se comparó con el de otros electrodos disponibles.

Palabras clave: Dopamina; ácido úrico, CQS; ZnO; Orina humana

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IMPACT OF THE ALKALINE HYDROLYSIS PROCESS ON PET FIBERS ON THE MECHANICAL PROPERTIES OF REINFORCED CONCRETE

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Abstract

This study investigates the influence of alkaline hydrolysis on the surface modification of recycled polyethylene terephthalate (PET) fibers and its effect on the compressive strength of reinforced concrete. PET fibers of varying lengths (1, 2, and 3 cm) and concentrations (0.15%, 0.25%, and 0.35%) were incorporated into concrete specimens following ASTM C31 and C39 standards. A significant increase in compressive strength, up to 10%, was observed for samples with 3 cm fibers.

To enhance the interaction between PET and cement, a surface treatment was carried out using alkaline hydrolysis under a Taguchi L9 experimental design. The effects of NaOH concentration, temperature, exposure time, and fiber-to-solution ratio were evaluated. SEM images revealed enhanced fiber degradation and roughness under high-concentration and high-temperature conditions.

Concrete samples containing treated PET fibers showed better cement adhesion and improved mechanical performance. However, excessive degradation reduced mechanical integrity, as shown by weight loss analysis and Young's modulus reduction. The best results were obtained at moderate hydrolysis conditions (1M NaOH, 70°C, 6 hours), which balanced surface modification and fiber strength. These findings demonstrate that controlled alkaline hydrolysis can significantly enhance the reinforcing efficiency of recycled PET fibers in concrete, offering a sustainable solution for waste management and construction material improvement.

Key Words: Alkaline hydrolysis, PET fibers, reinforced concrete, surface modification, compressive strength



Construcción e interpretación de diagramas de Pourbaix en estabilidad de metales

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Abstract

La construcción de los diagramas de Pourbaix no es explicada detalladamente en libros de texto. Por lo que es necesario exponer metodologías para su obtención. Conceptos mínimos para este efecto son potencial de hidrógeno, concentración molar, actividad, reacciones oxido-reducción, potencial electroquímico, entre otros.

La metodología exhibe como distinguir tres tipos de equilibrio, los cuales delimitan áreas de existencia de metales, iones metálicos, iones binarios, iones ternarios, óxidos e hidróxidos. Los tres tipos de equilibrio son: ecuación que depende de pH (líneas verticales), expresión que depende del potencial (líneas horizontales) y ecuación que depende de ambos (líneas con pendiente positiva o negativa). Una vez que se tiene las ecuaciones entre las especies que se quieren mostrar en el diagrama, las ecuaciones se grafican y se empiezan a delimitar las zonas encontrando los puntos invariantes (puntos donde coinciden tres equilibrios) y otros criterios.

Los diagramas de Pourbaix son herramientas termodinámicas que se aplican en procesos industriales. Se expone el uso del diagrama en la disolución de oro con cianuro en medio básico y la explicación del porqué no se debe desechar mercurio en cuerpos de agua naturales ya que se incorpora a la cadena trófica por medio de metilmercurio.

Key Words: Procesado de metales, Química Analítica, Disolución de Oro, Disolución de Mercurio.



Mycosynthesis and characterisation of silver nanoparticles from the fungus *Phytophthora infestans* with potential applications in the agro-industrial sector.

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Abstract

Nowadays, the care of solanaceae, specifically tomatoes, also known as red tomatoes, has taken on great relevance as the most commercialised and exported vegetable in Mexico, according to the Ministry of Agriculture and Rural Development (Secretaría de Agricultura y Desarrollo Rural) (1). These are susceptible to multiple diseases such as late blight caused by the fungus *Phytophthora infestans*, which significantly affects the plant, causing lesions on the stem, leaves and fruit.(2)

This represents significant qualitative and quantitative losses, which is why attempts have been made to eradicate the fungus with the use of chemical fungicides, but there has been evidence of an increase in the appearance of aggressive strains resistant to these products. (3)

For these reasons, a myco-nanotechnological technique is being developed, in which a mycosynthesis process is carried out using fungal biomass and synthesised metabolites.

It is known that Ag nanoparticles have antibacterial, bacteriostatic and fungicidal properties, these qualities give them the capacity to be applied in different fields, such as medicine and agriculture.

This is why they become a safe alternative in the management of plant diseases.

For the synthesis of Ag NPs, the protocol proposed by (Narware, J, 2023) was used, where the *P. infestans* strain was grown in PDA broth at 27 °C for 72 h at 150 revolutions per minute (rpm). The mycelial mats were then harvested and washed with double distilled water, and the mycelial mat was immediately incubated in 100 ml of sterile double distilled water for

48 h at 150 rpm. After the indicated time lapse, the biomass was filtered in order to serve as a reducing agent in the green synthesis of nanoparticles.

Subsequently, the supernatant of the filtrate and AgNO₃ were added to 100 ml of distilled water and incubated in a shaker in dark conditions at room temperature for 72 h. The NPs were characterised by the addition of AgNO₃.

The silver NPs were characterised by ultraviolet-visible spectroscopy (UV-VIS) and X-ray diffraction (XRD).

Key words:

Tomato, late blight, mycosynthesis, silver nanoparticles, *Phytophthora infestans*.

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EFFECT OF ULTRASONIC TREATMENT ON THE DISPERSION, COLLOIDAL STABILITY, AND OPTICAL PROPERTIES OF NaEuF₄ PARTICLES

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Abstract

This study aims to optimize the dispersion of NaEuF₄ powders via ultrasound treatment in acidic media (HCl and HNO₃) at varying concentrations (5 and 10 mg/mL) and acid volumes (0.2 and 2 mL) to minimize agglomeration and enhance colloidal stability. The treated material was subsequently embedded in a polyvinyl alcohol (PVA) matrix to assess its distribution, morphology, and optical performance.

Scanning Electron Microscopy (SEM) revealed a pronounced reduction in agglomerate size post-functionalization, yielding an average spherical particle size of approximately 0.29 μm . X-ray diffraction (XRD) confirmed the formation of the hexagonal NaEuF₄ phase, while infrared spectroscopy exhibited characteristic bands near 3400 cm^{-1} (O–H stretching), 1630 cm^{-1} (O–H bending), and around 500 cm^{-1} (metal–fluorine vibrations), indicating retention of the crystalline structure and the presence of surface functional groups. Moreover, the characteristic europium luminescent emission at 612 nm remained stable even after dispersion in the polymer matrix.

These findings underscore the importance of controlling the medium conditions, applying chemical functionalization, and utilizing ultrasonic treatment to achieve a homogeneous and stable dispersion of luminescent materials, which is crucial for advancing optical devices and related functional systems.

Key Words: NaEuF₄, ultrasonic dispersion, colloidal stability, polymeric matrix (PVA)



GESTIÓN BIOTECNOLÓGICA DE UN BIOFERTILIZANTE A BASE DE CÁSCARAS DE NARANJA Y AZOTOBACTER

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Abstract

The intensive use of chemical fertilizers has led to environmental issues and soil degradation. This project proposes the development of a biofertilizer using Azotobacter, a nitrogen-fixing bacterium, with orange peels as a substrate. The goal is to enhance soil fertility, reduce agrochemical dependency, and utilize agro-industrial waste for sustainable agriculture. The proposed biofertilizer is an eco-friendly and accessible alternative to synthetic fertilizers. It makes use of agro-industrial waste and promotes agricultural sustainability. However, further testing is required to assess its long-term effectiveness and commercial viability.

Key Words: Biotechnological, Management, Biofertilizer, Orange Peels, Azotobacter.

**EVALUATION OF THE ANTIFUNGAL ACTIVITY OF THE
BIOCOMPOSITE SYNTHESIZED FROM CU/MNO NPS AND *Cucumis
sativus* SEEDS AGAINST THE PATHOGENIC FUNGUS *Fusarium
oxysporum*.**

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Abstract

Cucumber (*Cucumis sativus* L.), a member of the Cucurbitaceae family, is a widely cultivated vegetable crop valued for its crisp texture, high water content, and nutritional benefits. As a fast-growing annual vine, it thrives in temperate and tropical climates [1]. Economically, cucumbers contribute significantly to smallholder livelihoods and commercial farming, with top producers in Asia and North America [2]. However, its production faces threats from several diseases; one notable being Fusarium wilt, caused by the soil-borne fungus *Fusarium oxysporum* f. sp. *Cucumerinum* [3]. The following document makes a case for copper/manganese oxide bimetallic nanoparticles (Cu/MnO NPs) (both having strong antifungal properties) as an alternative to fungicides [4,5]

Cu/MnO NPs were characterized with analysis that first displayed its optical properties. Through UV-Vis, the two metals' existence after the synthesis was proven. Then, to understand the structural characteristics of NPs, analysis like scanning and transmission electron microscopy were carried out, providing information about the NPs' size, morphology and placement in the seeds. Further confirmation of the two metals' existence was conducted through Energy Dispersion Spectroscopy (EDS) and Dynamic Light Scattering (DLS). Finally, to demonstrate the antifungal activity against *F. oxysporum*, an *in vitro* assay was developed via the exposure of *Cucumis sativus* seeds to a petri dish culture of the fungus. The UV-Vis graph proves the existence of the two metals by the characteristic SPR bands of MnO in the 400 nm region and the presence of variable size Cu nanoparticles indicated in the 800nm region. The SEM/EDS shows the presence of Cu/MnO NPs all over the seed with the quantities of each, copper being the most common but with manganese in the same places, proving that they are in fact bimetallic NPs. In TEM micrographs the information obtained revealed the Cu/MnO NPs are quasi-spherical and averaging a size of 37nm. The antifungal assay proof this property of the NPs, having no seeds treated infected by the fungus, compared to all the controls showing disease like symptoms. In conclusion, a one-step experimental setup was presented to generate Cu/MnO whose in-vitro antifungal activity has promising results for further development.

Key words: Cu/MnO NPs, *C. sativus*, *F. oxysporum*, Antifungal activity

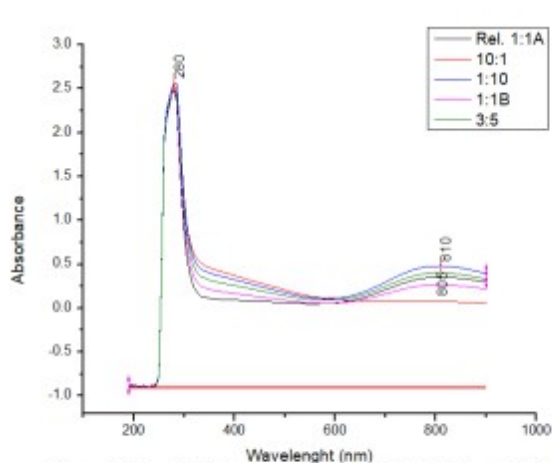


Figure 1: Graphic from UV-Vis of Cu/MnO NPs at different concentrations.

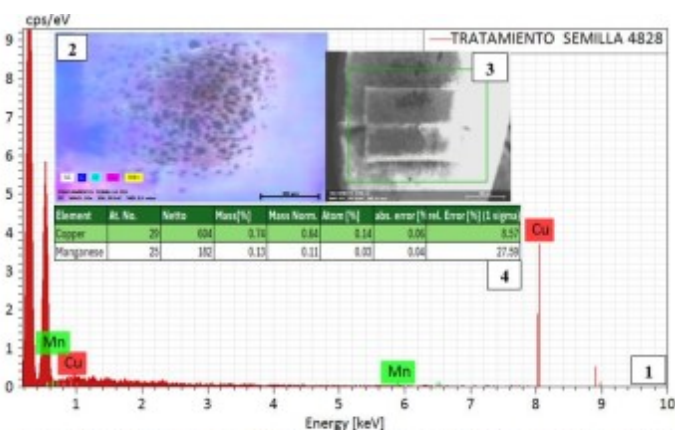


Figure 2: Data from SEM-EDS analysis. 1. Graph of elementary analysis focusing on the two metals. 2. Chemical mapping of elements present in the sample. 3. Micrograph at 400 μm. 4. Table of elements' content.

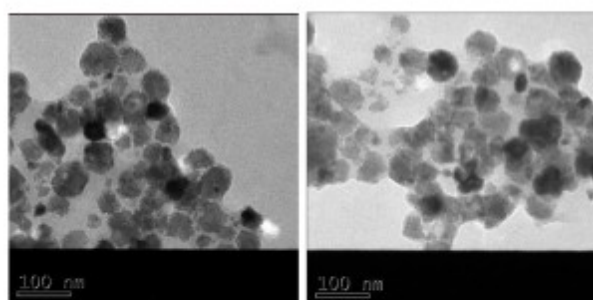


Figure 3: TEM's Micrographs from Cu/MnO NPs at 100 nm.

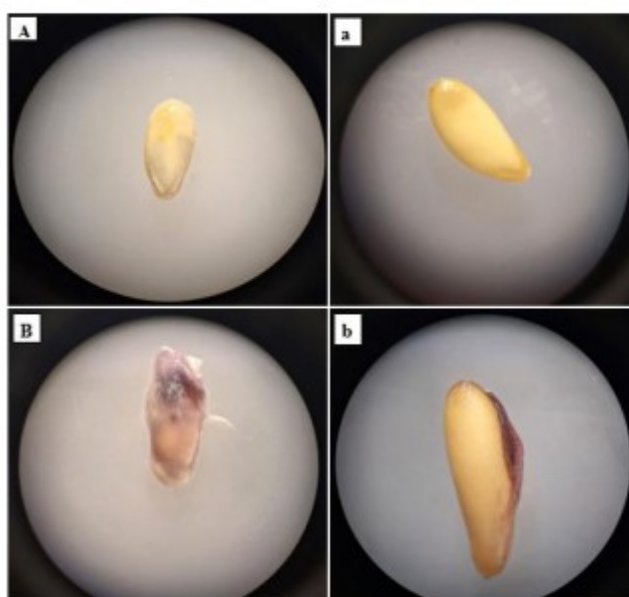


Figure 4: Antifungal assay's results in a *C. sativus* seed magnified with a dissecting microscope (aka. Stereo). A & a: Seeds from Control and Treatment samples respectively at 1×10^6 spore concentration. B & b: Seeds from Control and Treatment samples respectively at 1×10^7 spore concentration.

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SYNTHESIS OF POLYMERIC NANOENCAPSULATION WITH HIGH MOLECULAR WEIGHT CHITOSAN BY THE EMULSION-DIFFUSION METHOD FOR ITS PHARMACEUTICAL APPLICATION

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Nanomedicine, as defined by the *European Science Foundation* , It is presented as an alternative for the diagnosis, prevention and treatment of diseases [1]. The ability of nanocapsules to contain liposoluble drugs in their lipid core improves their solubility and absorption, allowing to reduce the necessary dose [2]. Nanoencapsulation , studied in various areas, offers a promising solution for the selective release of active ingredients. The objective of the study is to synthesize and characterize polymeric nanoencapsules using the emulsion-diffusion method. Specific objectives include developing chitosan nanocapsules and characterizing them by Atomic Force Microscopy (AFM) . The emulsion-diffusion method is described, which involves the preparation of an oil-in-water (O/W) emulsion using surfactants such as Tween 20 and Span 85, followed by crosslinking of chitosan with sodium sulfate. The obtained nanocapsules are separated and washed for further characterization. Spherical nanocapsules with sizes ranging from 79 nm to 117 nm were obtained, with a round structure, which is consistent with the scientific literature. The use of Tween 20 facilitates the passage of nanoparticles through the blood-brain barrier, while chitosan, whose molecular weight influences the properties of the nanocapsules , plays a crucial role in nanoencapsulation . The emulsion-diffusion method is presented as an effective technique for the production of nanoencapsules with specific characteristics such as size and morphology [3]. The obtained nanocapsules had an average size of 91 nm, with measurements ranging from 79 to 117 nm, which are within the parameters established in the scientific literature. This study paves the way for future research in the pharmaceutical field, with the aim of developing less aggressive and more specific treatments [4].

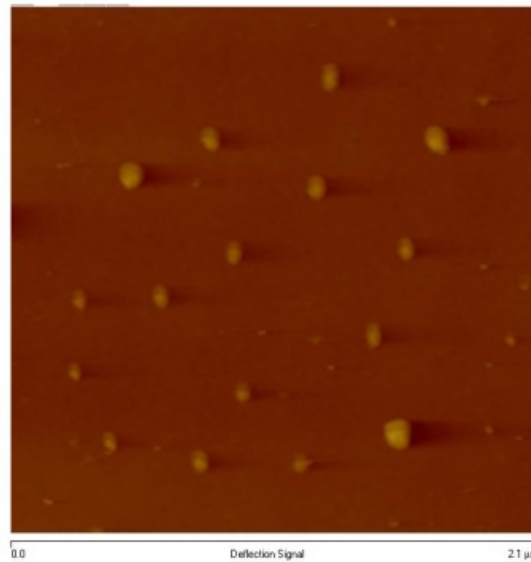


Figure 1.1 Polymeric nanocapsules observed by atomic force microscopy

Keywords : Emulsion, surfactants, crosslinking.

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¿WHAT'S IS A NANOSYSTEM? PRINCIPLES AND APPLICATIONS IN NANOMEDICINE, NANOELECTRONICS AND ENVIRONMENTAL NANOTECHNOLOGY.

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Abstract.

A nanosystem in the area of nanosciences and nanotechnologies is a set of different elements at atomic, molecular and nanometric scales, where it is possible to generate, change or modify the elemental properties of different types of substances. Designing a nanosystem is not a simple task; it requires compliance with a large number of variables and parameters that stabilize its constituent parts: the nucleus, the coupling agent and the active principle. Each element must comply with a series of compatible characteristics such as electronegativity, polarity, electronic affinity, hybridization of molecular orbitals, pH and in many cases the physicochemical flexibility of any of these elements to withstand temperature variations, electric or magnetic fields that are around, which could generate a loss in the stability of the nanosystem. In the area of nanoelectronics (Figure 1), nanosystems are used to generate technologies called SOC (system on a chip) and LOC (lab on a chip) devices, which have the capacity to generate an analysis at the molecular level, in real time and with a level of precision of up to ppb (parts per billion). In Nanomedicine (Figure 2), nanosystems are used for the controlled release of drugs through molecular recognition mechanisms, generating a treatment in the area of interest and that the drug takes effect selectively in a tissue, organ and even cell, is an extremely complex task that required a development of more than 25 years using supramolecular chemistry and quantum chemistry. And in the area of environmental nanotechnology (Figure 3), we are currently seeking to develop elements to monitor in real time the growth of plants and crops of high added value for its demand or value in the market, but in a modern context, the consumer now requires to know the storage time of the product, its degree of acidity or alkalinity, its nutritional value and even if the food was exposed to different contaminants during the agricultural process (fertilizers or insecticides), the nutritional value and even if the food was exposed to different contaminants during the agricultural process (fertilizers or insecticides), which with the passage of time and the handling of different products of the field can generate toxic residues that in the long term we are observing that the vast majority of the current population now has micro and nanoplastics in their bodies, despite following a strict diet or high nutritional value. Nanosystems are a 4th generation nanotechnology tool that will allow us to improve, optimize, identify, monitor and know the current status of different products and services that we now need in our daily life, for that reason it is important to let the general public know that this type of molecular architectures are essential for increasing the quality of life of people, the improvement of products and services of different companies, and therefore, a better quality of life that will help us to introduce nanosciences and nanotechnologies in our daily life [1-5].

Key Words: Nanosystems, SOC, LOC, drug delivery, physicochemical flexibility.

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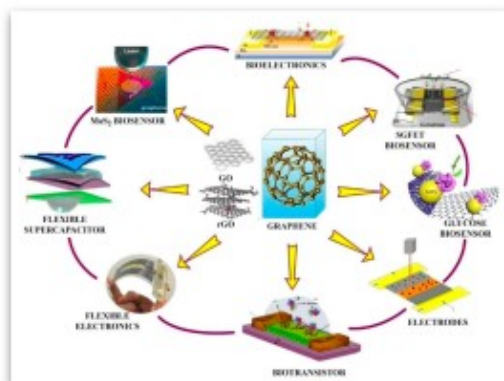


Figure 1. Nanoelectronic devices.

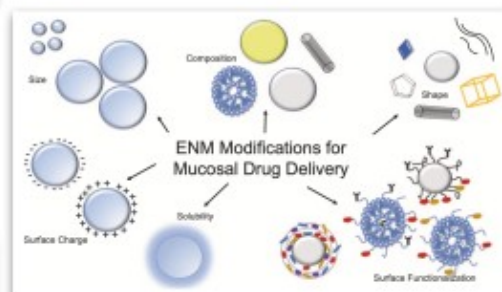


Figure 2. Nanosystems ENM.

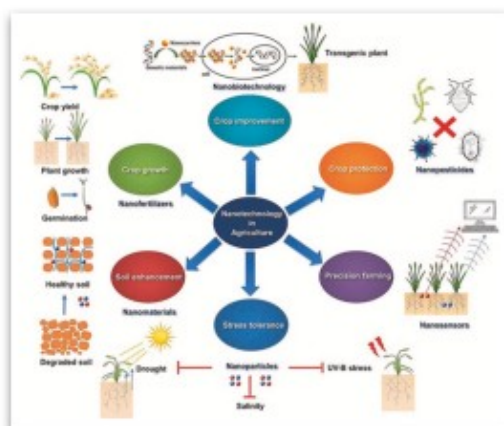


Figure 3. Nanosystems in agriculture.



DETERMINATION OF THE FLOW LINES OF A 1045 STEEL OBTAINED BY COLD FORGING PROCESS

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Abstract

The forging process is widely used in modern industry [1], where the pursuit of high product quality is crucial. However, achieving this quality is complex without a deep understanding of the mechanical properties of the material and the operation of the equipment [2]. Smaller companies often resort to trial and error, which can result in significant financial losses. To address this challenge, numerical simulation [1] has been adopted, which uses computers to predict the mechanical behavior of materials such as AISI 1045 steel. This type of steel, known for its ease of forming [3], is used in the manufacture of crankshafts, connecting rods, axles, and other components. By deforming a metal to a certain degree, slip patterns known as flow lines can be observed, the distribution of which can be crucial in defining the final quality of the product.

Key words: 1045 Steel, Flow lines, forging, Microstructure.

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NANOENCAPSULATION OF ALOE VERA WITH CELLULOSE NANOCLUSTERS IN A CORNCOB-BASED CREAM WITH ANTI-AGING PROPERTIES.

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Abstract

This research project focuses on the development of an innovative anti-aging cream that combines advanced technologies in nanotechnology and biotechnology. The formulation integrates the nanoencapsulation of aloe vera extract with cellulose quantum dots and a sustainable corncob-based foundation, creating a bioproduct that merges biological components with nanoengineered systems. These technologies aim to enhance the bioavailability, stability, and effectiveness of the active compounds while ensuring their compatibility with the skin.

The proposed dermocosmetic product bridges modern scientific advancements with pre-Hispanic herbal traditions, reflecting a holistic approach to skincare innovation. It incorporates rigorous evaluation of physicochemical stability, ingredient compatibility, and bioactivity, ensuring optimal performance against signs of aging. Aligned with principles of sustainability and environmental responsibility, this project aims to deliver an eco-friendly, highly effective solution that addresses the growing demand for innovative, science-driven, and sustainable skincare products.

Key Words: Nanotechnology, Biotechnology, Nanoencapsulation, Anti-aging skincare, Sustainable cosmetics, pre-Hispanic herbal traditions.

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ULTRASOUND-ASSISTED DISPERSION OF SrAl_2O_4 PARTICLES IN AQUEOUS MEDIUM: COLLOIDAL STABILITY AND OPTICAL PROPERTIES

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Abstract

This work presents the ultrasound-assisted dispersion of strontium aluminate (SrAl_2O_4) particles in acidic aqueous media, focusing on the influence of surface functionalization on colloidal stability and optical properties. The particles were treated with concentrations of HCl and HNO_3 of 0.5ml and 2 ml respectively, to induce surface charge modifications and reduce agglomeration. Dispersion performance was evaluated based on sedimentation time, morphology, and particle distribution.

Scanning Electron Microscopy revealed that treatments with low concentrations of HCl (0.5 mL) resulted in better particle separation and reduced agglomerate formation, improving colloidal stability over time. Infrared spectroscopy confirmed that the chemical structure of SrAl_2O_4 was preserved after functionalization. Subsequently, functionalized and non-functionalized particles were incorporated into a polyvinyl alcohol (PVA) matrix to evaluate their translucency.

The results showed that functionalized particles produced more homogeneous coatings, with fewer bubbles and clearer light transmission. In contrast, non-functionalized samples exhibited poor dispersion, greater agglomeration, and lower optical clarity. This study highlights the role of surface chemistry and pH control in improving the dispersion and optical performance of SrAl_2O_4 -based systems, with potential applications in optical coatings and luminescent materials.

KeyWords: dispersion, ultrasound, sedimentation, translucency, agglomerate, coating.



OBTENCIÓN Y EVALUACIÓN DE NANOPARTÍCULAS DE HIDRÓXIDO DE CALCIO PARA RESTAURACIÓN

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Resumen

La restauración juega un papel relevante pues los objetos que conforman el patrimonio cultural tangible, pueden ser muebles e inmuebles. Desde hace más de una década la nanocal, llamada comercialmente Nanorestore® es empleada México para la consolidación de diferentes objetos con problemas de disgregación y pulverulencia, por lo que en este trabajo se propone la obtención de nanopartículas de hidróxido de calcio y evaluar en probetas pertenecientes a un estuco del siglo XVI. Se observó que las nanopartículas obtenidas consolidan de manera efectiva, para posteriormente realizar pruebas de dureza y peso, resultando un incremento de estos valores significativamente.

Las nanopartículas de óxido de calcio e hidróxido de calcio se sintetizaron a través del método hidrotermal utilizando $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ como precursor de calcio; se llevaron a cabo diferentes reacciones con parámetros distintos para evaluar la influencia de la temperatura de síntesis y el tiempo de reacción. Se disolvieron 35.42g de $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ en 30 ml de agua destilada. Posteriormente, se añadió 7.82ml de PEG. Se añadió NaOH a la solución de $\text{Ca}(\text{NO}_3)_2$ gota a gota para cambiar el pH. La mezcla resultante se agitó vigorosamente a temperatura ambiente hasta lograr una suspensión uniforme transparente, la suspensión obtenida se transfirió un autoclave, sellado y tratado hidrotérmicamente a una temperatura de reacción constante entre el rango de 70-130°C por 12 y 24 horas. La mezcla obtenida se enfrió a temperatura ambiente y luego la fase sólida fue separada de la fase líquida en una centrifuga a 600rpm y 20 min, se sometió a 5 lavados con agua destilada para eliminar las impurezas, finalmente, las partículas obtenidas se secaron a 90°C durante 24 horas.

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FUNCTIONAL THEORY STUDY OF THE DENSITY OF ARSENIC ADSORPTION BY ALUMINA NANOPARTICLES FOR DISPOSAL IN DRINKING WATER

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Abstract

Arsenic contamination in water, mainly present as arsenite (As (III)) and arsenate (As(V)), requires efficient solutions based on nanotechnology. In this work, the study of the use of alumina nanoparticles (Al_2O_3) as adsorbent of As (III) and As (V), polluting species present in drinking water sources in our country and in the world, using the method of the Density Functional Theory (DFT) not only to know the key atomic interactions (chemical bonding, electronic structure, adsorption energy, energy barriers, among others), but also to design more efficient and tailor-made nanostructured adsorbents. The theoretical-computational methodology to apply the DFT method is presented here, which includes the modeling of volume, regular and defective surfaces, as well as nanoparticles of the alpha alumina material; the modeling of the pollutant species of As (III) and As (V) with its corresponding exploration of the potential energy surface for the study of the As/ Al_2O_3 interaction; the use of programs with the DFT method implemented and the supercomputing resources required to calculate the structure and properties of the systems studied.

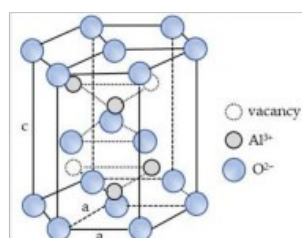


Figure 1. Alumina

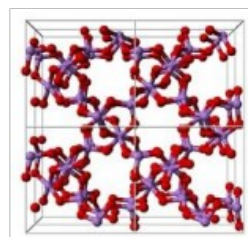


Figure 2. Arsenic (V) Arsenate

Key Words: DFT Modeling, Al_2O_3 , Arsenic, Adsorption, Water Purification.

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FABRICATION AND CHARACTERIZATION OF MULTILAYER PANELS REINFORCED WITH CARBON NANOTUBES

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Abstract

This technical report presents the development of a multilayer panel reinforced with carbon nanotubes (CNTs) to enhance the impact resistance of composite materials used in industries requiring lightweight, strong, and safe structures, such as automotive, aerospace, and protective equipment.

A sonochemical technique was employed to achieve a homogeneous dispersion of functionalized CNTs in polymeric matrices of epoxy resin and transparent polyurethane (TPU) at concentrations of 0.15% and 0.10% by weight. This method effectively deagglomerates CNTs, increasing the interphase area between the nanotubes and the polymer matrix, which significantly improves interlayer cohesion and enhances energy absorption under dynamic loads. Optical microscopy and infrared spectroscopy confirmed the successful dispersion and chemical stability of the system.

For the first time, a modified Charpy impact test was used to correlate interlayer energy in composites with CNT content. The mechanical behavior of six laminated panels composed of aluminum and TPU reinforced with the modified matrices was evaluated. The results demonstrated that the functionalized CNT load in the polymer matrix influences the behavior of the multilayer composites, as evidenced by a reduction in the impact area observed in the modified Charpy tests.

Key Words: Carbon Nanotubes (CNT), Multilayer Composite Panel, Impact Resistance

SYNTHESIS OF ALOE VERA-BASED SILVER NANOPARTICLES; EVALUATION OF THE POTENTIAL ANTIMICROBIAL EFFECT

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ABSTRACT

Throughout history, bacteria have caused morbidity and mortality in different parts of the world. To combat this, medications known as antibacterials or antibiotics have saved millions of lives and, at the same time, have revolutionized medicine. There are several types of natural, semi-synthetic, and synthetic agents with distinct mechanisms of action, capable of causing significant metabolic and physiological alterations [1]. The inappropriate use of these medications has generated what is currently known as "antibiotic resistance," a problem that is growing every day, giving bacteria the opportunity to find new ways to adapt.

Therefore, it is important to find new alternatives that, alone or in conjunction with antibiotics, provide a favorable response to the presence of bacterial pathogens.

Currently, the antimicrobial activity of silver nanoparticles is being exploited by industry to manufacture beauty products and medications. Its use in the biomedical field is of interest due to its significant progress in the treatment of infections and tissue regeneration [2], drug delivery for wound healing, and antibacterial activity, due to its special and tunable qualities [3].

Silver has been used as an antimicrobial for years, and the organic compounds in Aloe vera allow it to be a potential reducer in the synthesis of silver nanoparticles. Their individual characteristics give this combination promising potential antimicrobial properties.

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COVALENT ORGANIC FRAMEWORKS (COF) AND METAL-ORGANIC FRAMEWORKS (MOF) AND SOME OF THEIR APPLICATIONS

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Abstract

Covalent Organic Frameworks and Metal-organic Frameworks are crystalline and porous structures, which in the case of metal-organic networks include metal ions. They have different applications in various fields, such as medicine, environmental engineering, electronics, chemistry, etc. They have diverse applications such as catalysts, collectors of polluting gases that generate the greenhouse effect, biocompatible materials, sensors, etc.

Key Words: COFs, MOFs, Crystals, Nanoporous, Nanomaterials

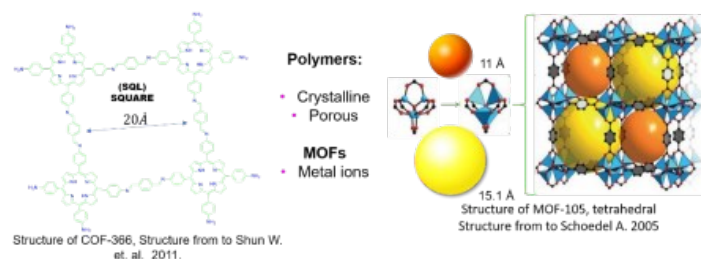


Figure 1 – Example of a COF and a MOF.

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ESTUDIO SUPERFICIAL DE LA RUGOSIDAD Y MORFOLOGÍA DE LA ASPEREZA DE UN RECUBRIMIENTO BIFÁSICO DE BORO EN UN ACERO HERRAMENTAL

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Resumen

En el área de tribología es de gran relevancia estudiar las superficies o rugosidades y esto se debe a que los primeros contactos, propiciados por la rugosidad, con movimiento relativo van a definir el comportamiento del desgaste y coeficiente de fricción hasta llegar al desgaste catastrófico, al generar un recubrimiento termoquímico de boro se presentarán cambios en las propiedades mecánicas, rugosidades y asperezas, es por eso que se estudia un recubrimiento de borurado en un aceros A36; se utiliza la técnica de borurado con pasta deshidratada, los tiempos de permanencia se analizan a 10, 30 y 50 minutos con una temperatura de incubación de 900 °C; se realizan estudios de XRD para evidenciar la presencia del recubrimiento de FeB y Fe₂B [1-3]; de igual forma se efectúan limpiezas superficiales en baño por ultrasonido antes y después del tratamiento termoquímico; antes y después del recubrimiento se analizan las topologías de las muestras mediante perfilómetro óptico, figura 1, se puede evidenciar la existencia de morfologías llamadas clúster y valles de asperezas, revelando que la rugosidad Sa, Sq y Sz aumenta en los recubrimientos con 30 minutos de permanencia y disminuyen al presentar 50 minutos de incubación, mostrando crecimientos no homogéneos de las asperezas y sus acumulaciones de las morfologías llamadas clúster [4-5]; se detectan cambios superficiales en las 4 condiciones experimentales con microscopio óptico; por último, se estima el cálculo del área real de contacto para cada condición superficial. [6-7]

Key Words: tribología, borurado, asperezas, clúster.

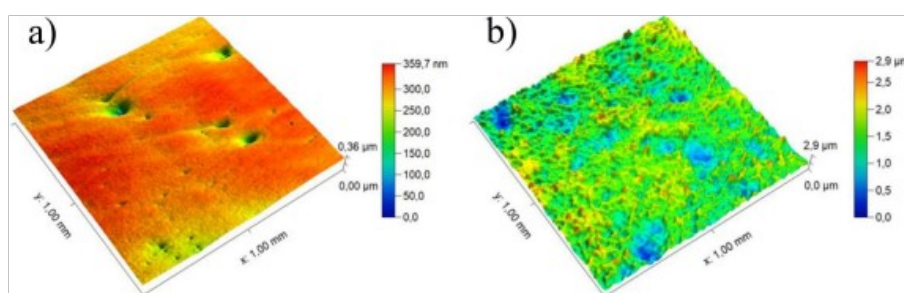


Figura 1. Caracterización superficial y morfológica de las superficies a) sin recubrimiento y b) con recubrimiento de boro a 10 minutos de permanencia.

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