

SoDoFi

Informativo

BOLETÍN TRIMESTRAL DE LA SOCIEDAD DOMINICANA DE FÍSICA EDITORIAL

Ciertamente el mundo actual se mantiene en el avance constante en diferentes campos del quehacer científico y tecnológico, lo cual es muestra del desarrollo permanente y sostenido en el cual nos encontramos. Uno de estos campos es el de la Inteligencia Artificial (AI, por sus siglas en inglés), la cual crece a pasos agigantados y va permeando en las diferentes áreas, como lo es el caso de la educación. En tal sentido, ha causado revuelo a nivel mundial lo que es la utilización en el ámbito educativo del software ChatGPT, el cual es un chatbot desarrollado por la compañía OpenAI, que fue lanzado al mercado en noviembre del pasado año 2022, que se basa en el modelo de lenguaje por AI y que se ha convertido en un tema polémico dentro de la comunidad académica por el uso que los estudiantes hacen del mismo.

En otro aspecto, el pasado mes de enero entre los días 15 al 18 del presente año, SoDoFi celebró su IV Congreso Internacional de la Sociedad Dominicana de Física (IV CI-SoDoFi 2023), como de costumbre contó con la colaboración y participación entusiasta de un gran número de sus miembros, del apoyo económico de sectores educativos y empresariales, además de la participación de conferencistas nacionales e internacionales que forman parte de la comunidad científica y académica que se reúne anualmente para celebrar esta gran fiesta de la Física en República Dominicana. Seguimos avanzando y mostrando siempre nuestra pasión por la Física.

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IV CONGRESO INTERNACIONAL DE FÍSICA (IV CI-SoDoFi 2023)

Por Comité Organizador

INTRODUCCIÓN

En esta edición estaremos presentando un resumen general de los trabajos presentados durante nuestro IV Congreso Internacional de la Sociedad Dominicana de Física (IV CI-SoDoFi 2023), el mismo se celebró del 15 al 18 de Enero del presente año 2023 en el Catalonia Bávaro Beach, Golf & Casino Resort, Punta Cana, República Dominicana. En dicho evento se presentaron 4 conferencias magistrales, 1 conferencia especial, 32 conferencias concurrentes y 7 trabajos de estudiantes.

TEMÁTICAS DEL CONGRESO:

Las líneas temáticas del Congreso fueron las siguientes:

- Ciencias de la Tierra
- Física Médica
- Física Educativa
- Física Estadística y Termodinámica
- Astronomía y Astrofísica
- Econofísica
- Estado Sólido, Nanociencias y Nanotecnología
- Energía
- Física Matemática
- Partículas y Campos
- Historia y Filosofía de Física
- Física de Polímeros

CONFERENCIAS MAGISTRALES

Challenges in Particle Physics

Mayda M. Velasco Bonilla, Professor and Director of COFI Institute, Department of Physics and Astronomy, Northwestern University. m-velasco@northwestern.edu

The Standard Model of Particle Physics is a very successful theory that explains a large diversity of physical phenomena, that range from what holds atoms and nuclei together, to the accurate prediction of the transformation (decay) of heavy particles into lighter ones. Particles in the Standard Model acquire mass through the Higgs mechanism and the recent discovery of the Higgs and the study of its properties confirm in great detail this physical picture. The amazing theory and experimental results, however, leaves many open questions, ranging from Dark Matter to the unexplained matter-antimatter asymmetry of the universe. I will briefly present the experimental program and challenges we are experiencing to solve some of these mysteries at the Large Hadron Collider at the CERN.



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CONTINUACIÓN

Advanced Carbon Materials for Energy Storage and Environmental Applications

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World is facing an unprecedented crisis due to climate change, pollution and water shortages. Many aspects of the crisis dramatically affect developing countries. Nanotechnology, which involves the design, characterization, production and application of materials and devices by controlling shape and size at the nanoscale, is the basis of the next industrial revolution, and promises to contribute to the mitigation of various problems caused by the crisis. The need to develop clean sustainable energy sources and technologies is reputed globally as immediate precedence. In this respect, there is an urgent need to improve advanced energy sources and storage technologies. Supercapacitors, as high power and high energy density storage systems attract much interest for their application in renewable energy sources. Although they are currently applied in energy storage systems, many research groups keep searching for new electrode materials to increase their performances and reduce the cost and the environmental impact due to their production. Another huge problem is the scarcity of safe water, especially in developing countries. With a growing world population and an environment affected by climate change, access to clean water is going to be a compelling need in next years.

Nanoscience and nanotechnology have proven to give substantial contribution to alleviate needs for removing contamination, and research is active worldwide to improve the efficiency of water cleaning systems, also in terms of their cost. Carbon-based nanomaterials are a class of materials that are widely used in energy and water related applications, due to their excellent mechanical, electrical, thermal and chemical properties.

Here I will present the synthesis of carbon nanomaterials obtained by bottom-up and top-down strategies, and their application as supercapacitor electrodes and for the removal of contaminants in water. For supercapacitor electrodes, we used orange-juice-derived active carbon, which gave an almost perfect electrical-double-layer behavior, with excellent stability. The same kind of synthesis was applied to obtain active carbon from Spartium Junceum, a typical plant of southern Italy. Such active carbon was tested as an adsorbent for Methylene Blue dye, giving a removal efficiency of 420 mg/g, much higher with respect to the average value of similar materials found in the literature.

Using a top-down strategy, we oxidized graphite by H_2SO_4 and KMnO_4 , and eco-friendly reduced the resulting oxide by citric acid. We demonstrated that such green-reduced graphene oxide can be used for the efficient removal of Hg ions from aqueous solutions. We obtained fast adsorption kinetics and saturation Hg capacity of 110 mg/g at room temperature. Moreover, we found good adsorption efficiency over a wide range of initial Hg concentrations and a broad range of pH. The same material was also tested as an adsorbent to remove Methylene Blue dye from water, giving an adsorption capacity of about 120 mg/g.

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Polymeric- and Bio-Materials for Environmental and Biomedical Applications

Eduardo Nicolau, Professor and Executive Director of Molecular Sciences Research Center, Department of Chemistry, University of Puerto Rico - Rio Piedras Campus. eduardo.nicolau@upr.edu

In recent years, the field of polymer chemistry has developed tremendously, in part thanks to advances in synthetic chemistry. These semi-rigid materials offer a variety of advantages for applications in the environmental and biomedical fields. In this talk, we will discuss the use of polymers and biological materials to create membranes with hierarchical architectures that are responsive or reactive at their interface. Special emphasis will be placed on the use of this concept for the development of membranes for applications in molecular separations in the liquid state (filtration) and the recovery of materials. In addition, we will explore the use of these polymeric materials with a variety of presentations for applications in the biomedical area. In particular, the use of bioactive polymeric materials for the regeneration of bone tissue will be discussed. The talk is tailored to an audience with diverse interests in general topics of chemical and physical sciences.



Cryogenic High Accuracy Refraction Measurements Capabilities and New FUV Coating Mirror Technology Developments

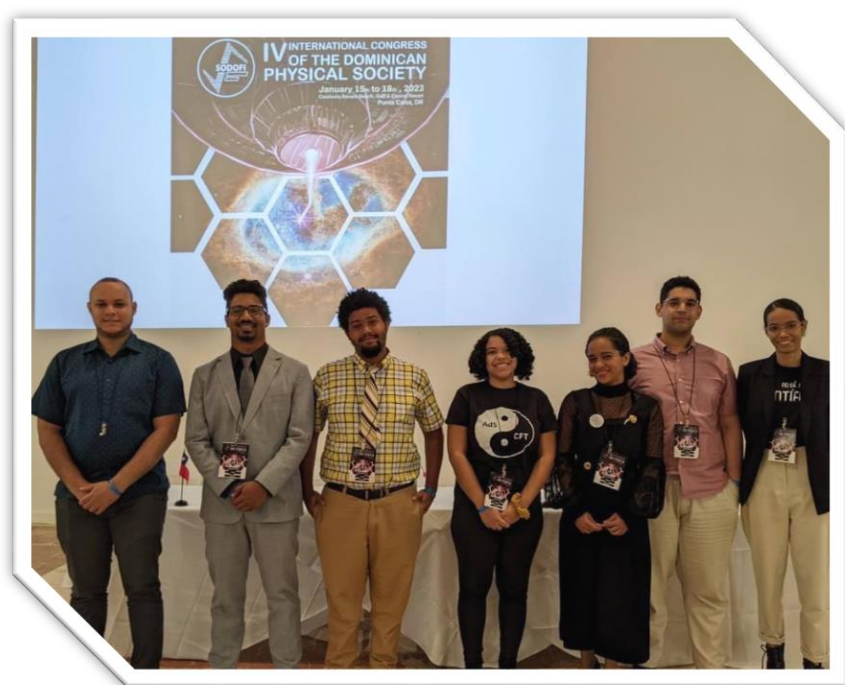
Manuel Quijada, Research Physicist, Components Group Lead Optics Branch, NASA-Goddard Space Flight Center. manuel.a.quijada@nasa.gov



This talk will emphasize the basic principles of refractive materials used in an optical telescope. In particular, the presentation will describe refractive index measurements that were performed for one of the instruments on the James Webb Space Telescope (JWST). A refractive system design was implemented in the Near-Infrared Camera (NIRCam) which is one of the main instruments on the JWST observatory. This camera was designed to make observations in the infrared part of the optical spectrum, and it is required to operate in a space environment at temperatures as low as 25K. Therefore, it was imperative to know the refractive index at those low cryogenic temperatures for the various glass substrates (ZnSe, LiF and BaF₂) used in the system design of NIRCam. These cryogenic index of refraction measurements were carried out by using the world-class refractometer called the Cryogenic High Accuracy Refraction Measuring System (CHARMS) facility that was designed and built at the Goddard Space Flight Center (GSFC) in Greenbelt, MD.

In the second part, there will be a discussion of the recent advances on the research and development activities of advanced and new mirror coating technologies that provide high reflectance performance in the far-ultraviolet (FUV) part of the optical spectrum. These new mirror coatings are envisioned for use on the reflecting mirrors of the next mission (beyond JWST) that will focus on astronomical observations in the FUV spectral range to deliver new and exciting discoveries about the origin of the cosmos.

IV CONGRESO INTERNACIONAL DE FÍSICA (IV CI-SoDoFi 2023)



Estudiantes expositores en el CI-SoDoFi 2023



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ACTIVIDADES DEL TRIMESTRE

El 10 de Diciembre del año 2022 se realizó el Encuentro Navideño de SoDoFi en el Hotel Crown Plaza, Santo Domingo, a las 7:30 PM. Durante el mismo se reconocieron a varios miembros plenos de SoDoFi en un ambiente cargado de alegría y confraternidad.

El pasado 1ro de Febrero del 2023, se celebró la defensa de las tesis de grado de Licenciatura en Física de **Thara Caba** y **Eliacim Vélez**. Las mismas son fruto del acuerdo firmado entre SoDoFi, la Universidad Autónoma de Santo Domingo (UASD) y la Universidad de Padua, Italia. Estos estudiantes contaron con asesores la Universidad de Padua y co-asesoras de la UASD, las doctoras Kety Jiménez y Nelphy de la Cruz, como fruto de dicho convenio. Las defensas se llevaron a cabo en el Salón de Conferencias Rosa Angélica Espinal Ramos (CU) en la UASD, a partir de las 11:00 a.m.

El martes 28 de febrero del 2023, se realizó la conferencia titulada: Análisis del potencial eólico urbano con fines energéticos en climas tropicales. A cargo de: **Alexander Vallejo Díaz**, candidato a Doctor en Gestión Energética. Instituto Especializado de Estudios Superiores Loyola (IEESL). Instituto Tecnológico de Santo Domingo (INTEC). La misma fue organizada por la División de Energía de la Sociedad Dominicana de Física (SoDoFi), en modalidad virtual, en horario de 6:00 a 7:00 PM.

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Encuentro navideño 2022



Thara Caba

Eliacim Vélez

La División de Energía de SODOFI les invita a la conferencia:

Análisis del potencial eólico urbano con fines energéticos en climas tropicales

Horario: martes 28 de feb de 2023 - 6pm - 7pm (Hora estándar del Atlántico - Santo Domingo)

Modalidad: Virtual
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