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Editorial: Spotlight on nanotechnology: Latin America

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Editorial on the Research Topic

Spotlight on nanotechnology: Latin America

Introduction

Nanotechnology is certainly a rapidly expanding research area that is translating into a broad spectrum of applications, from biomedicine to industry. The term was introduced in 1974, although the foundational concepts were proposed by American physicist Richard Feynman, a Nobel Laureate, in 1959. Since then, research and practical applications of nanotechnological discoveries have grown significantly. In 2024, over 256,000 papers related to nanotechnology were indexed in the Web of Science (WoS) database (Statnano, 2025a). China, India, and the United States are the leading countries producing publications on nano-systems. Regionally, educational institutions and research centers that published more than 50 nanotechnology-related articles in 2024 in the top 10% of journals with the highest Impact Factor (IF) are predominantly based in Asian countries (44.7%), followed by European (30.4%) and North American countries (20.9%). Latin American countries account for 2.3% (Statnano, 2025b). These numbers highlight the focus on nanotechnology in these regions. In Latin America, Brazil is the leading country in this field, followed by Mexico and Argentina. The Brazilian Nanotechnology National Laboratory, managed by the Ministry of Science, Technology, and Innovation, conducts significant research in nanotechnology. In Argentina, the Ministry of Science, Technology, and Innovation launched the Federal Plan to Promote Biotechnology and Nanotechnology in 2022, with an initial investment of \$3,800 million Argentine pesos allocated for 2023. Mexico's research in nanotechnology is carried out by research centers, universities, and National Laboratories such as the National Nanotechnology Laboratory and the National Laboratory on Micro and Nanofluidics. Both laboratories are currently overseen by the Ministry of Science, Humanities, Technology, and Innovation.

This Research Topic on "Spotlight on Nanotechnology: Latin America" highlights some of the research currently being developed in this region. The Research Topic contains five contributions: one in energy, two in biomedicine, and two in environmental remediation.

Energy

The research reported in the paper by [De Souza et al.](#) involves contrasting three synthetic routes for PtRu/C catalysts to be applied in polymer electrolyte fuel cells, using methanol (CH₃OH) oxidation as the target process. The findings underscore the potential of the synthesized catalysts for use in direct CH₃OH fuel cells, which would offer better performance than catalysts prepared by alternative routes.

Biomedicine

The paper by [Farfán-Castro et al.](#) expands existing evidence on the potential of using AuNPs as biocompatible and effective transporters for nanovaccine design, as the obtained conjugates did not induce irreversible *in vitro* cytotoxic effects. Further, the results show the capacity to provide long-term and broad protection against SARS-CoV-2 VOC, independent of conventional adjuvants.

[Chávez-Hernández et al.](#) tested the performance of polyvinylpyrrolidone (PVP)-coated AgNPs on the small intestine contraction as well as other mediators in an *ex vivo* model (intestinal segments). Five concentrations of AgNPs and three individual concentrations of PVP-coated AgNPs were used as cumulative. The results indicate that the small intestine is a key target of the actions induced by AgNP, modifying the intestinal motility that affects nutrient absorption efficiency.

Environmental remediation

The article by [Camposeco et al.](#) reports on the effect of combining titanium dioxide (TiO₂) with mordenite zeolite to support AuNPs in the low temperature oxidation of carbon monoxide (CO). The catalysts tested performed satisfactorily in converting CO into CO₂. It was found that the presence of TiO₂ in mordenite, combined with the addition of AuNPs, promotes the partial coverage of the structural channels of the zeolite, thereby increasing efficiency at room temperature in CO oxidation.

[Oros-Ruiz et al.](#) report the one-pot solvothermal synthesis and characterization of hierarchical BiOI and GO/BiOI microspheres with high photoactivity against rhodamine B (RhB) and methylene blue (MB), as well as their performance for H₂ production using very low-power sources. In particular, the GO/BiOI heterojunction demonstrated superior performance in terms of RhB degradation, considering nominal power consumption vs. RhB degradation efficiency. Scavenger assays showed that the main species causing the RhB oxidation are holes and peroxide radicals. When it comes to H₂ production, the GO/BiOI heterojunction showed satisfactory results when using low-power UV lamp irradiation.

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The papers published in this Research Topic showcase the diverse approaches and significant advancements achieved in nanotechnology in Brazil and Mexico. To ensure continued progress, institutions across Latin America must actively strengthen interdisciplinary collaboration to address the challenges hindering research in these promising technologies.

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