

MEON Seminar Slot

6th November 2024, 15h00, CENIMAT, Leopoldo Guimarães Auditorium

Title: Advancing Sustainable Electronics: Functionalizing Cellulose with Conjugated Polymers for High-Performance Applications

Abstract

The rapid growth of electronic consumption has led to an alarming increase in electronic waste (e-waste), posing significant environmental challenges. E-waste, which includes discarded electronic devices and components, is growing at an unprecedented rate. In 2021, global e-waste generation reached approximately 57.4 million metric tons, a number expected to increase annually as consumer demand for electronics rises. This surge has raised concerns over the sustainability of traditional electronics, which often rely on non-biodegradable materials and toxic substances.

As an alternative, cellulose—a biodegradable, renewable material—has emerged as a potential solution to mitigate the e-waste crisis. Derived from plant matter, cellulose is abundant and naturally decomposable, making it an attractive candidate for sustainable electronics. However, cellulose-based electronics face certain limitations, including lower electrical conductivity and mechanical performance compared to conventional materials, which restrict their application in high-performance electronic systems.

To overcome these challenges, conjugated polymers present a promising avenue for innovation. These polymers can be processed into conductive inks that can functionalize cellulose, enabling the development of high-performance, eco-friendly, non-toxic, electronic devices. By integrating conjugated polymers with cellulose, it is possible to make advanced energy harvesting, pressure sensing, and information transmission technologies, paving the way for a new generation of sustainable, high-performance electronics.

This seminar will explore the full potential of conjugated polymer-functionalized cellulose, examining how current state-of-the-art advancements justify their feasibility as a solution to the e-waste problem. This talk will delve into the challenges, breakthroughs, and future directions in this promising field, highlighting its role in fostering environmentally friendly electronic systems.

Speaker – Guilherme Ferreira



He is a PhD student in Nanotechnology and Nanoscience, specializing in advanced materials and sustainable technology. He earned his master's degree in Micro and Nanotechnology Engineering from NOVA-FCT in 2019. He joined as a research fellow at CENIMAT/i3N in 2019, where he developed expertise in polymer chemistry and materials for self-powered sensing and energy applications. His research focuses on innovative materials for energy harvesting, electronics, and cellulose-based smart technologies for next-generation devices.

1. Journal of Energy Chemistry, 2024, Available online 30 October 2024
2. Chemical Engineering Journal, 2024, 480, 147995.
3. Nano Energy, 2022, 95, 107021
4. Advanced Functional Materials 2019, 30, 1908994