Valorisation of Industrial Waste: Sustainable Nanocellulose for Next-Generation Electrochemical Technologies

Jihene BELHAJ[1,2,*]
Viviana BRESSI[1], Ramzi KHIARI[3] and Claudia ESPRO[1]
[1]*Department of Engineering, University of Messina, Italy*.
[2]*Department of Textile Engineering, University of Monastir, Tunisia.*
[3]*Department of Textile, Higher Institute of Technological Studies of Ksar Hellal, Ksar Hellal 5070, Tunisia.*
Jihenebelhadj27@gmail.com

Abstract

The study focuses on the valorisation of agricultural residues, specifically the olive waste generated post-oil extraction, as a cost effective and sustainable feedstock for producing biodegradable, functional and green nanocellulose based materials. , The nanocellulose extracted through cellulose isolation from these residues serves as a green nanomaterial platform that addresses both ecological and economic objectives, offering rapid scalability for industrial integration [1], [2].
This research aims, to enhance the use of available natural sources through the development of a new generation of environmentally friendly nanomaterials. The physico-chemical properties of the extracted nanomaterials were tailored via surface functionalization to enhance their electrical conductivity and sensing performance. Subsequently, the bio nano-composite is drop casted onto the working electrode the surface of commercial screen-printed carbon electrodes (SPCE) forming the basis of a highly sensitive and selective electrochemical sensor. This sensor is designed for the detection and real-time monitoring of critical environmental pollutants , including heavy metal ions and nano plastics, which pose significant risks to public health in contemporary contexts.

References

[1] S. Liu *et al.*, 'Construction of a novel electrochemical sensor based on biomass material nanocellulose and its detection of acetaminophen', *RSC Adv.*, vol. 12, no. 43, pp. 27736–27745, Sep. 2022, doi: 10.1039/D2RA04125A.
[2] M. M. Langari, M. M. Antxustegi, and J. Labidi, 'Nanocellulose-based sensing platforms for heavy metal ions detection: A comprehensive review', *Chemosphere*, vol. 302, p. 134823, Sep. 2022, doi: 10.1016/j.chemosphere.2022.134823.

Figure

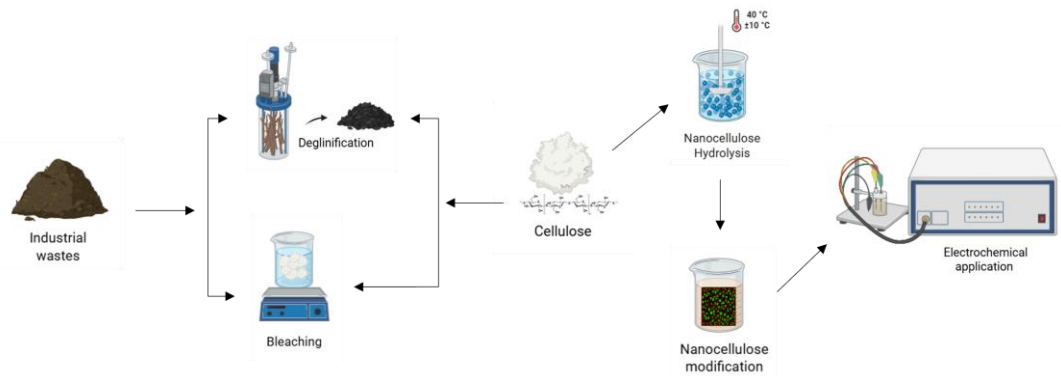

Figure 1: the different production steps to obtain semiconductor nanocellulose from agriculture wastes for electrochemical application