

Development of efficient and innovative biomass refining processes using eutectic solvents

Armando J. D. Silvestre, PhD, Hab.

Head, Department of Chemistry
Full Professor
Department of Chemistry
CICECO Aveiro Institute of Materials
University of Aveiro
Aveiro, Portugal



Abstract

This talk will highlight some flagship examples of the contribution of ionic liquids (ILs) and eutectic solvents (ESs) to more sustainable and efficient processes for biomass refining and polymer recycling.

Sustainable development is amongst the major concerns of society and the global scientific community. Towards this aim, using renewable resources and, particularly, biomass, as sources of chemicals, materials, fuels, and energy within the biorefinery concept is essential. Furthermore, the implementation of the broader concept of “circular economy,” instead of the current linear model, is also paramount. However, the implementation of both biorefinery and circular economy concepts poses an enormous challenge, because it represents, in many aspects, a deep change in paradigm of current industrial processes. Developing innovative and more sustainable processes for fractionation and conversion of biomass and recycling of commodities thereof is a major priority.

In this context, innovative solvents, such as ionic liquids (ILs) and eutectic solvents (ESs), might play an important role. ILs have a high potential in biomass pre-treatment. Huge improvements in target compounds solubility and selectivity can be achieved during the isolation of bioactive extractives, particularly in the case of ILs aqueous solutions, due to either micellar or hydrotropic mechanisms. Meanwhile, ESs have the advantage of being much simpler to prepare, and thus less expensive than ILs, yet they bear some of the same properties. ESs have been used as efficient media for the pre-extraction and valorisation of bioactive and macromolecular compounds, as well as delignification. Further, in a very recent study we demonstrated that ES can be used as catalysts for the cascade depolymerization of polyesters, such as poly(ethylene furandicarboxylate) (PEF).

Bio

Prof. Armando Silvestre is a Full Professor at University of Aveiro, in the Department of Chemistry and CICECO Aveiro Institute of Materials. He is currently Head of the Department of Chemistry and is also a member of CICECO Group 4- Biorefineries, Biobased Materials and Recycling.

He earned his Ph.D. in Organic Chemistry in 1994 at the University of Aveiro (UA) and was hired as Auxiliary Professor in the Dept. of Chemistry, UA. In 2002, he was promoted to Associate Professor and earned his Habilitation degree in Chemistry in 2008. He was promoted to Full Professor in 2018.

His research interests are focused on the Biorefinery concept: the sustainable extraction and upgrading of added-value compounds from biomass through the use benign solvents (using ionic liquids, deep eutectic solvents); synthesis of new biobased polymers derived from 2,5-furandicarboxylic acid; and new functional (nano)composite materials and biomaterials based on biopolymers and cellulose (nano)fibers.