Joint Event

35th Nano Congress for Future Advancements

3rd International Conference on Nanotechnology & Chemistry

April 17-18, 2023

Paris, France

J Nanomater Mol Nanotechnol 2023, Volume 12

Spruce and beech sawmill waste as a source of nanolignin

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Wood processing produces large amount of residues such as barks, shavings, sawdust, chips. For instance, to produce 1 m3 of sawn timber, 1.7 to 2 m3 of log are required, generating nearly 50% of waste. The valorization of 1 m3 of a log by sawing produces then about 8-10% ok barks, 10-13% of sawdust and 20-30% of other wood chips (data for beech and spruce). Pulping and wood energy are the main outlet for these wastes, while many other valorization possibilities could be envisaged.

Wood is a lignocellulosic material mainly composed of three polymeric fractions, cellulose, hemicellulose and lignin, which are highly entangled. As much as cellulose and hemicelluloses are well valorized today, lignin remains completely under-valued (thermal valorization). Thanks to its aromatic structure, lignin has many properties (biocide, antioxidant, UV-light blocker) which could be useful in technical applications. One of the ways of valorization of lignin still poorly explored is the production of nanolignins.

Usually, the usefulness of nanoparticles lies in their size (<100 nm), which provides them a high surface reactivity as well as physic and chemical properties that the materials would not have at a macroscopic scale. Nanoparticles are now a days intentionally incorporated in many consumer- products as for example sunscreens, toothpastes as well as in electronic devices and new medicinal treatments. The two goals of this work are to optimize a green extraction process of macrolignin from wood waste and then to optimize nanolignin production from lignin for a future valorization in both pharmaceutical and cosmetics applications.