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Functionalization of lignin for the preparation of agro-based materials

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PURPOSE OF THE ABSTRACT

Lignin is the third most abundant biopolymer after cellulose and chitin. Co-product of the paper industry, it is nowadays mainly burned for an energetic valorization because of the lack of any added-value valorization. In fact, in 2010, 50 million of tons of lignin have been extracted and only 2% have been valorized in the formulation of higher added-value products. Lignin's structure is complex and difficult to valorize but is elsewhere very attractive as this biopolymer is the main non-petroleum resource of aromatic structures. In a context of transition from fossil carbon to renewable carbon, bio-based monomers containing aromatics are particularly attractive as they are essential to access rigid plastics. [1,2]

The research leads two main methods for lignin valorization. The first one is based on depolymerization processes in order to obtain small biobased molecules that can be used for the production of new polymers or chemicals. [1] The second method consists in keeping the structure of lignin and grafting chains on it in order to improve its physico-chemical and/or thermal properties. In fact, native lignin has a low solubility, low compatibility and is thermally unstable. Suitable chemical modifications can improve the processability of the biopolymer. [1,3] Still, the performed transformations should be green and economic in atoms thanks to the combined use of homogeneous catalysis and biobased reagents. Previous works have been led on the direct grafting of unsaturated aliphatic chains through the palladium catalyzed telomerization reaction which impedes the possibility of catalyst recovery. [3,4] Alternatively, this communication will present new functionalizations using linkers issuing from glycerol, a co-product of the biodiesel industry. The catalytic step is involved in the synthesis of the linker thus allowing an easier catalyst separation. The modified lignins are further used in the formulation of bitumen or in blend with biobased plastics.

FIGURES

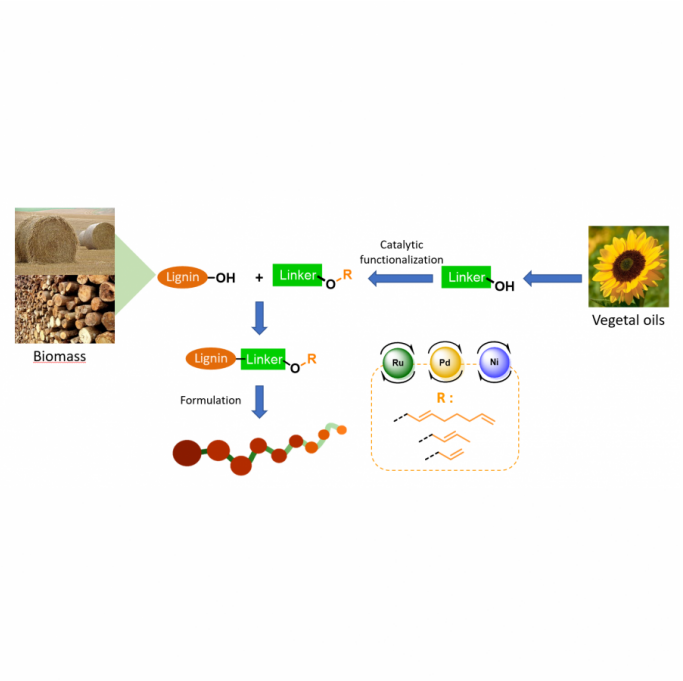

FIGURE 1

Figure 1: Functionalization of lignin via linker.

Linkers from vegetal oils are functionalized by aliphatic chains using organometallic catalysis. The modified linkers are then grafted on technical lignin.

FIGURE 2

KEYWORDS

Lignin | Catalysis | Functionalization

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