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Lignocellulosic biomass valorization by reductive depolymerization in supercritical ethanol.

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PURPOSE OF THE ABSTRACT

Diminishing fossil fuel reserves and degradation of the environment are high important concerns now a day. These concerns push the scientific community to look for new and efficient processes to convert renewable biomass feedstock into both high value chemicals and liquid fuels.1 Thus, the production of added-value biochemicals and biomaterials by biorefinery approaches using non-edible sources is highly demanded.2 In this sense lignin, the second most abundant natural polymer, is a readily available and renewable feedstock to be employed in the synthesis of high added-value products and/or key intermediates. In fact, the lignin structure includes a variety of functional groups, hydroxyl, methoxyl, carbonyl etc., and can be chemically modified to prepare polyurethanes, acrylates, epoxides etc..3,4 Nevertheless, the use of lignin as feedstock is hampered by its inherent low reactivity, mainly associated to the steric effects that limits the accessibility to the active groups in the lignin structure. To overcome these drawbacks to boost the lignin reactivity there are two efficient ways namely: 1) its depolymerisation or liquefaction5 and 2) its functionalisation by ring opening polymerization (ROP).6 Concerning lignin depolymerization there are several methods in the literature for lignin depolymerization, g.e. via acid catalysts, metallic catalysts, base catalysts, the oxidative route, the reductive route etc. but most of them required tedious workups for the isolation of the depolymerized lignin fraction.7 Among these depolymerization methods the combination of supercritical ethanol with a reduction agent and/or catalysts has been shown as a very promising alternative to valorize lignin into a bio-oil with a bundle of applications g.e polymers field.

Here, we present the results obtained from a lignocellulosic biomass depolymerization by the reductive route in supercritical ethanol and formic acid as H2. The influence of various reaction parameters (temperature, reaction time etc.) in the obtained bio-oil was studied. In addition, the bio-oil form lignin depolymerization was tested as (co)monomer in polymerization processes currently using oil-derived phenolics, e.g. in manufacturing phenol-formaldehyde resins used as coatings and adhesives. Thus, showing the potential of the lignocellulosic biomass as feedstock in the manufacturing of polymers.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

depolymerizacion | supercritical ethanol | bio-oil | coatings

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