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Valorization of novel biorefinery furanic thermosettings

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PURPOSE OF THE ABSTRACT
Chemicals derived from lignocellulosic biomass could provide sustainable and environmentally friendly solutions to current petroleum-derived products. Two of the most prominent examples, are the acid-catalysed dehydration of C5 and C6 sugars, leading to the formation of furfural (FF) and 5-hydroxymethylfurfural (HMF). Furans derived from cellulose and hemicellulose have the ample potential to be used to design new biobased resins.
Furfural is today one of the most important first-generation furan derivative. Most of the furfural produced worldwide is converted into furfuryl alcohol (FA) by an easy derivatisation process. FA can be polymerized through cationic condensation reactions to obtain polyfurfurylalcohol (PFA). The high carbon content, chemical inertness and thermal stability of PFA have led to several applications. PFA can be mixed with sand to obtain a composite which is used as foundry cores and moulds. FA impregnation and in-situ polymerization in wood is used to improve wood durability. Nanostructured carbons and nanocomposites derived from PFA have been largely studied. High performance PFA/silica nanocomposites with improved thermal stability have been elaborated. PFA has also been successfully combined with cellulose derived fibre.
Humins is another example of furanic biomass derived thermoset material. Humins is a biobased material, co-product of the acid-catalyzed conversions of cellulose and hemicellulose to platform chemicals. Humins is a carbonaceous, heterogeneous, and polydisperse macromolecules with a furanic structure containing aldehydes, ketone and hydroxyls as main functional groups. Humins has been suggested for a wide range of applications. Lately, we also demonstrated the possibility of using humins as resin to produce all green composites and for wood modification.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS
furanics thermosetting | humins | PFA

BIBLIOGRAPHY