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Bio-based materials from renewable resources: A brief overview

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Our research is focused on the use of raw materials which come from renewable sources and it aims at replacing those derived from petrochemical routes. In this context, cellulose derivatives have been synthesized for diversified applications1, polymers have been prepared for applications such as films, as well as matrices in composites reinforced with lignocellulosic fibers 2,3, which have also been used as reinforcement of biopolymers obtained on an industrial scale 4. In addition, bio-based mats have been prepared from the electrospinning of solutions obtained from the dissolution of lignocellulosic fibers and/or from their main constituents, combined or not with other polymers. The methodologies used in these studies have followed what is described in the respective papers. Ongoing studies are conducted by using similar methodologies to those described in the papers already published. Lignins and derivative (such as lignosulfonates) have successfully replaced phenols in the synthesis of phenolic resins subsequently used as matrices in composites reinforced with lignocellulosic fibers (such as sugarcane bagasse, coconut, sisal, curauá), as well as polyol replacements in the synthesis of polyurethanes (combine or not with castor oil), which were later used as matrices and also as films. Recent studies, as well as those in progress, have shown that the properties of mats such as the diameters of ultrafine (submicron) and nanometric (diameter ≤ 100 nm) fibers, tensile properties, among others, can be tuned by the electrospinning of solutions obtained by the simultaneous dissolution of lignocellulosic fibers or the constituents thereof (cellulose and/or lignin) and a polymer, both when the fibers are randomly oriented and when they are preferably oriented in a certain direction. The set of results obtained in the mentioned studies, as well as in others not cited herein, has generally met the expectations and matches the worldwide tendency to seek raw material from renewable sources that leads to products with good properties.

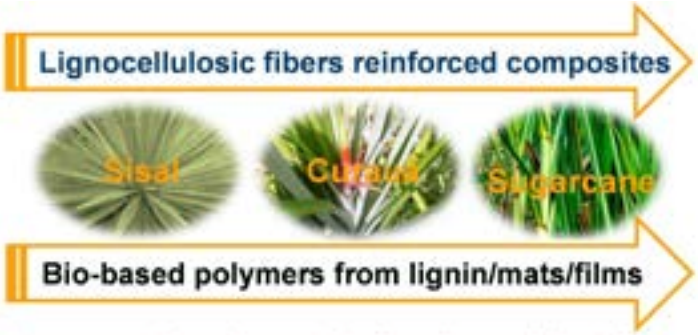

Figure 1: Bio-based materials from lignocellulosic fibers

Biography

Elisabete Frollini is the Head of the Macromolecular Materials and Lignocellulosic Fiber Group, and is currently the Coordinator of the Center for Research on Science and Technology of BioResources (Institute of Chemistry of Sao Carlos, University of Sao Paulo, Sao Carlos, Sao Paulo, Brazil). She has expertise in bio-based polymeric materials from biomass with an emphasis on lignocellulosic biomass, which has also been used within the scope of biorefinery.

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