Co-products and biomass waste are raw materials for chemicals products

By Sílvio Vaz Jr

Embrapa Agroenergy – - In the last years, considerable effort has been expended for the use of co-products and waste processes to convert biomass to add value to productive chains and reduce potential environmental impacts.

The concepts of green chemistry and biorefinery are focused on the utilization of waste with the objective of obtaining value chains similar to those of petroleum, but with less impact to the environment. These concepts should include integrated systems (raw material, process, product and waste) sustainable, according to technical parameters that take into account, among other things, the energy and mass balances, the cycle of life and reduction of greenhouse gas emissions of the processes of production of biofuels, chemicals, electricity and heat.

According to these concepts, chemicals developed from co-products and residues are often those with the highest potential to add value to productive chains, depending on the strategic involvement of the chemical industry in the supply of inputs and final products to various sectors of economy, such as petrochemical, pharmaceutical, automotive, construction, agribusiness, cosmetics, etc.

As the concept of biorefinery is broad, by nature, and comprehensive in its industrial and economic special interest has been given to the development of chemicals from the deconstruction of lignocellulosic material constituent of plants and their thermal processing.

In deconstruction, biomass, after going through several pre-physical and chemical treatments (eg termoalcalino, steam explosion and organosolvente) provides the polymer lignin, cellulose and hemicellulose. In the thermal processing, in the case of fast pyrolysis biomass is incinerated in controlled presence of oxygen providing bio-oil and biochar.

According to a survey of the U.S. Department of Energy published in 2007, there are the following possibilities for the use of lignin as a precursor of new chemicals, mostly as an alternative to petroleum products, liquid fuels and solvents (benzene, toluene and xylenes); copolymers with high mechanical strength and heat for the production of polyesters, thermoplastic elastomers, polyurethanes heat resistant, macromonomers, and composites of carbon fibers, organic fillers low cost, kinins, mixture of benzylic aldehyde, mixture of phenol and a mixture of aromatic acids and aliphatic.

Such compounds may have application as antiviral agents, sequestering agents (chelators), wood preservatives, stabilizers, enzyme, and oil leakage controller, among others. It should be noted that the uses depend largely on the type of pre-treatment applied for obtaining a lignin, as it has heterogeneous molecular structure, and have not been determined.

The cellulose and hemicellulose, once hydrolyzed, decompose in pentoses and hexoses. The new derivatives of these sugars were also the subject of publication of the U.S. Department of Energy in 2004 and revised critically in the journal Green Chemistry in 2010, it was concluded that derivatives of these sugars are of greater industrial potential: levulinic acid, and lactic succinic; hidroxipropiônicos acid and aldehyde, ethanol, furans, hydrocarbons, glycerol derivatives, sorbitol, xylitol and arabinol.

This group of products derived from cellulose and hemicellulose can be used as solvents, fuels, monomers for plastics, chemical intermediates for the pharmaceutical and fine chemicals in general, among others.

Both derivatives of lignin and sugars are being developed under a strong trend for manufacturers to obtain compounds of blocks (blocks build), ie compounds which may be used as precursors for a wide variety of other compounds of diverse industrial applications, in most cases, as already mentioned, to substitute products of petrochemical origin.

Biochar, in turn, is a byproduct that has agronomic interest for application as controlled release fertilizers, and environmental, for their possible applications in the prevention of environmental pollution and decontamination of water bodies (surface and underground) and impacted by toxic metals. In both instances, such applications are due to the presence of chemical groups polar and non-polar, referring to the structural and functional characteristics of the lignin component of the biomass.

The bio-oil, it can be used as fuel to replace diesel fuel to produce heat and energy with less environmental impact, and as wood preservative because of its fungicidal activity.

Thus, the possibilities resulting from the optimal use of biomass into biorefinery represent enormous potential for a country like Brazil, even considering the scientific and technological challenges for the development of new products and their manufacturing processes.

Source: *Embrapa Agroenergy*

Translated by Gilberto Silber Schmidt

You also Follow Labex Korea by Twitter