Scientists at CIAB developed technology to selectively recover fermentable sugars and aromatic lignin from lignocelluloses

Scientists at DBT's Center of Innovative and Applied Bioprocessing (CIAB), Mohali developed a modified method for the enriched lignin recovery from biomass, which employs the sequential dissolution using deep eutectic solvent and solvent extraction procedures. Upon acidic digestion of the biomass, the supplementation of tetrahydrofuran and sodium chloride greatly helps in the recovery of released lignin to the organic phase with the formation of a biphasic layer, which facilitates easy recovery of maximum lignin with fewer carbohydrate residuals and lignin fragmentation.

This approach resulted in 33% wt. lignin yield with the purity of 74% (acid-insoluble lignin), which is estimated to be 61% recovery to the original lignin content of lignocellulose (sawdust). While comparing the results with the traditional method, where alcohols are used as an extraction agent, relatively two times higher lignin recovery is achieved. Further, hydrodeoxygenation of the resultant organic medium in the presence of Ru/V_2O_5 yields a considerable quantity of market-value products, including butylated hydroxytoluene. On the other hand, the undigested residue is enriched with the fermentable carbohydrates, which can be utilized for the potential ethanol production. Apatent is filed on the technology. At present, the technology is at readiness level-2, a type of measurement system used to assess the maturity level of technology.

Crop residues are the most abundant and renewable resources on earth. However, the management of these enormously generated residues is slightly complicated. Its accumulation over the farmland not only deteriorates the environment but also affects the cultivation. Regrettably, the farmers preferred the open-field burning strategy (stubble burning) of the residues because it is considered as the cheapest method for disposal in fields. As a result, it creates a harmful effect on the environment, to humans and all life forms. Technically, these materials commonly referred to as lignocellulose due to its inherent composition. It is composed of more than 50% wt. carbohydrates in the form of cellulose and hemicellulose polymers, 20-26% wt. lignin, and the rest include ash (silica). Apart from carbohydrates, the aromatic lignin is also gaining much interest in the bioprocessing area for the production of simple aromatic molecules like benzene, toluene, and xylenes, which have the potential to replace the fossil fuel-derived polymeric products.

The primary steps involved in the recovery of lignin from biomass include acidic digestion and liquid-liquid solvent extraction. Traditionally, sulfite treatment, organosolv, and cellulolytic lignin isolation are commonly employed experiments for lignin isolation. However, the physical and chemical behavior of the isolated lignin varies depending on the raw material and extraction method employed. It is stated that non-fragmented lignin is a good source for the specific product generation. Sadly, most of the existing methods produce fragmented lignin.

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