生物质细胞壁组分结构解译与组分键合机制立项报告

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摘 要:生物质转化为高值化材料的关键一步是对组分进行清洁温和分离,然后将分离后的组分进行生物和化学转化,获得高性能材料。然而,由于生物质结构复杂,人们对其了解的局限导致对它们有效分离缺乏理论上的指向,使得目前的分离技术多是一种工艺层面的探索。迄今为止,尚没有高效的集成化生物质清洁分离技术体系,即在一个工艺过程中将生物质不同的组分能以较完整的分子结构形式清洁有效分离出来。由于生物质现代转化利用途径需要在保持较完整结构的基础上将主要组分清洁有效分离开来,然后对不同组分进行有目的的转化利用。因此,尽管生物质组分转化利用有广阔的应用前景,但生物质组分的清洁有效分离仍是一个瓶颈限制,是一个难点问题。生物质组分分离的关键是将断裂木质素组分和半纤维素组分之间的结合键或有选择性断裂木质素分子内的结合键,进一步达到清洁分离组分的目的。该研究拟从生物质组分间化学结合键的差异性以及空间构型的差异性中寻找其对不同差异介质环境中的反应机制,从而进一步提出氧基化学分离新途径的导向指引,即利用木质素侧链的α、β、γ-与半纤维素组分之间的酯键等结合键或木质素分子内不同化学键对不同微差异介质环境中化学体系中O_2分子的敏感性不同,探索其可能的分子内或分子外结合键的断裂途径,从而实现清洁温和分离纤维素、半纤维素和木质素组分的目的,为生物质的高值化利用奠定基础。

关键词:生物质 细胞壁组分 解译

Biomass Cell Wall Component Structural Interpretation and Bonding Mechanism

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Abstract: The key procedure of converting the biomass into high value materials is to separate the fractions clean and moderately and then to conduct the biological or chemical conversion of the separated fractions to obtain the high value materials. However, it , the lack of theoretical guide of effective separation on account of the limitation of our acquirement about the complexity of biomass structure, makes the separation technology become an exploration on process level. So far, there is no efficient integrated system for clean separation, which can separates different fractions at a fairly complete molecular structure clean and effectively in a process. The way of modern biomass utilization needs to separate its fractions clean and effectively under the premise of a fairly complete molecular structure and then carry out the purposeful conversion and utilization of different fractions. Despite the biomass conversion and utilization have broad application prospects, the clean and effective separation is still a bottleneck restriction and a difficult problem. The key to the separation of biomass components is to break the bond between lignin and hemicellulose or to selectively break the intramolecular bond among lignin achieving the purpose of clean separation. This study intends to find the reaction mechanism under different medium environment from the differences of the bonds among the fractions and the differences of spatial configuration, and then propose an orientation guidance of oxygen chemical separation . Scilicet, making use of the different sensitivities to O2 of different bonds, which between lignin side chain of alpha, beta, gamma- and bonds among hemicellulose fractions, such as easter bond, or intramolecular bond among lignin molecules, to explore the possible fracture way in or between the molecular. Furthermore, on the basis of the above work

, this study intends to achieve the purpose of a clean and moderate separation of cellulose, hemicellulose and lignin fractions , laying a foundation for high value utilization of biomass.

Key Words: Biomass;Cell wall component;Interpretation

“木质素聚集态结构活化与功能芳基材料合成”项目立项报告

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摘　要:随着石油资源的日益缺乏,人们正在加紧寻找石油资源的替代品。生物质是石油资源最为潜在的替代物质,因为绝大部分基于石油的化工原料和产品都可以从生物质中提取得到,特别是生物质是可持续能源中唯一芳香基团的来源。目前,大部分的研究集中在构成木质生物质的三种主要成分(纤维素、半纤维素和木质素)中较容易转化的纤维素和半纤维素上。相反,利用木质素转化为高价值化学品的研究尚未引起足够的重视。木质素转化为高价值化学品,可解决生物质中木质素残渣难以有效利用的难题,从而实现生物质全组分的高效高值化利用。

关键词:木质素　清洁分离　生物炼制

The Activation of Lignin Aggregation Structure and Synthesis of Functional Aromatic Material

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Abstract: With the growing shortage of fossil fuels, it is stepping up efforts to find alternatives for fossil fuels. Biomass is the most potential alternative substances, because most of the petroleum-based chemical raw materials and products can be produced from biomass. However, most researches have focused on conversion of cellulose and hemicellulose, the relatively easy conversion components of lignocellulosic biomass, remaining lignin under-utilization. With its unique structure and chemical properties, lignin supplies an alternative raw material for the production of high-value phenolics.

Key Words: Lignin; Clearly separation; Biorefinery