Frontiers in Environmental Research
ISSN: 2960-026X
DOI: 10.61784/fer231213

RESEARCH PROGRESS ON BIOMASS WASTE RESOURCE UTILIZATION

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Abstract: This paper reviews the current status of biomass waste resource utilization, mainly from agricultural and forestry biomass waste and industrial biomass waste. 2 aspects are described in detail and The application prospects of biomass waste are prospected.
Keywords: Biomass waste; Resource; Use

1 AGRICULTURAL AND FORESTRY WASTE

In recent years, the rational development and utilization of biomass resources has become increasingly popular attracted the attention of all countries around the world, and also produced a huge number of biological high-quality waste, which contributes to the increasing depletion of natural resources on the earth and environmental pollution. Today, as the situation becomes increasingly serious, the rational utilization of biomass waste is an urgent matter. Its practical significance and far-reaching historical significance [1-3].
Biomass is a renewable, environmentally friendly, diverse and low- Toxic or even non-toxic excellent materials [4]. The wastes mainly include agricultural and forestry wastes, industrial wastes and urban wastes. China will meet the annual Producing a large amount of biomass waste, it will be difficult to discharge or incinerate it Cause serious environmental pollution [5-6]. Therefore, for the optimization of biomass It has good properties and can be widely used after proper treatment of its waste. Used in various fields such as environmental protection, medicine and agriculture, this can not only reduce The degree of environmental pollution can also be reasonably and effectively comprehensively utilized biomass Waste resources are in line with the concept of circular economy [7-8].
Biomass waste mainly includes agricultural and forestry organisms in terms of plants. physical waste, and in terms of animal waste, it mainly refers to waste from the tanning industry Skin collagen. This article provides a detailed review of various agricultural and forestry biomass wastes and the current research status of comprehensive utilization of waste skin collagen, and prospects for its Application prospects.
Agricultural and forestry biomass waste is a by-product of the agricultural and forestry production process, or waste discharged from the grain processing and forestry processing industries. It mainly includes cellulose, lignin, peanut shells, straw, corn cobs and plant tannins. The output of various types of biomass waste is huge, causing serious environmental pollution. Proper processing of these agricultural and forestry biomass wastes can be widely used in leather, paper and other industries, It has good application effects and development prospects.

1. 1 Cellulose

Cellulose is the most abundant renewable natural compound on earth. It is biodegradable and environmentally friendly and is widely found in green plants. and marine life. Cellulose is the main carbohydrate nutrient in plants Substance is the main raw material for textile, papermaking, chemical and other industries. It converts fiber into Functional materials obtained from proper processing of vegetarian waste can be widely used in various fields [9].
Pang Xinglei [9] used cellulose as raw material and synthesized a water-soluble cationic cellulose graft polymer through atom transfer radical polymerization. Cell-g-DMC, its effect on pulp was studied. The results show that Cell-g-DMC As a papermaking enhancer, its structure middle The hydroxyl groups, amine cations, etc. can interact with fibers, increase the bonding strength between fibers, and improve the strength properties of paper. Li Dejuan [10] Using dissolving pulp as the raw material and environmentally friendly ionic liquid as the cellulose solvent, a cellulose- based dithioate chain transfer agent was synthesized, and a water-soluble cellulose-based cationic linker was synthesized through reversible addition cleavage chain transfer free radical polymerization. It is a dendritic polymer papermaking additive, which also has a reinforcing effect on paper pulp. Anirudhan et al. [11] used a cellulose-based anion exchanger to treat wastewater. 6 Valence chromium, the effects of chromium concentration, pH and other factors on chromium removal rate were studied. The results show that this cellulose-based anionic Agent change can effectively remove chromium from wastewater. Divide rate exceeds 99.4%.

1. 2 Lignin

Lignin is one of the three major components of plant skeleton, and its content is only Natural raw resources second only to cellulose and hemicellulose. Lignin is A polycyclic polymeric organic compound containing negatively charged groups, which is resistant to heavy metals The size of ion adsorption capacity is proportional to its phenolic hydroxyl group, carboxyl group, amino group, etc. The site content is related to the spatial network structure. The lignin molecules Zhongcun at 1 /3 free phenolic hydroxyl and catechol groups, which can dissociate from metals The ions undergo chelation to produce a variety of chelates and complexes. The lignin waste is subjected to reactions such as

oxidation, reduction, hydrolysis and graft copolymerization. response, which can change the chemical properties of lignin and thereby improve its reaction activity [12].
Lu Xujie et al. [13] used lignin extracted from paper making black liquor as Coagulant was used to treat simulated printing and dyeing wastewater, and it was found that The COD removal rate reaches 56. 2%, the decolorization rate reaches 65.3%. Sriv- Astava et al. [14] studied the effect of lignin on Pb 2 + and Zn2 + adsorption used, the results show that lignin has Pb 2 + and Zn2 + Has good adsorption effect, with different treatment conditions, lignin has Pb 2+ and Zn2 + The adsorption capacity will also change.

1. 3 Peanut Shells

Peanut shells are rich in crude fiber, but during processing and utilization A large amount of peanut shells become waste, and China produces more than 100% of the peanut shells every year. Shell waste reaches 5000000 _ t, resulting in serious waste of resources. Waste peanut shells can be used as feed, adsorbent, etc. after proper treatment raw material, which can improve the utilization value of peanut shells and has important of significance.
Peanut shells are rich in nutrients, but they contain chemicals that are harmful to animals, and some of the lignin is not easily digested, so peanut shells are not Can be used directly as feed. If peanut shells are crushed and chemically and biochemically After being decomposed and mixed with rice bran, etc., a product with good effect can be obtained. Good animal feed. Peanut shells contain abundant capillary porous knots structure, with a large surface area and the ability to provide active groups such as hydroxyl and carboxyl groups groups for adsorption [6]. Wang Kaifeng et al. [15] powdered peanut shells Crushed and thoroughly washed before use Cr (VI) Wastewater treatment, result table Ming, in pH is 1 ~2, θ for Under the condition of 25℃, peanut shell adsorption wastewater Cr (VI) in 30 min When the adsorption equilibrium is reached, it is saturated Adsorption capacity is 3. 19 mg / g, this hour Cr (VI) of go remove Rate reach 86%. Zhao Hui et al. [16] used a certain concentration of hydrochloric acid to wash and crush the The pretreated peanut shells are modified, and then the product is Used with In the wastewater treatment of Cr (VI), the results show that in pH is
2, θ is Under the conditions of 25℃, modified peanut shells Cr (VI) waste water suction Attached processing 100 min, its removal rate reaches 87%.

1. 4 Straw

Straw is a natural renewable energy source and contains a large amount of cellulose. As a major agricultural country, China is extremely rich in straw resources. In some areas, excess straw is burned, causing serious waste of resources and environmental pollution. Therefore, it is necessary to recycle straw waste.
Preparation of biodiesel refers to the process of biomass producing liquid products, charcoal and combustible gas under anaerobic or anoxic conditions. Will Rice straw is used as raw material, which undergoes rapid pyrolysis and liquefaction, pressurized catalytic liquefaction, etc. conversion process, and then through hydrolysis, fermentation, and alkali-catalyzed conversion process, it can be To prepare biodiesel [17]. The technology for producing fuel ethanol from straw mainly includes three major steps: pretreatment, hydrolysis and fermentation. Among them, pretreatment and water Decomposition is the degradation of carbohydrates in plant cell walls, turning them into simple Sugar, using straw liquefaction technology to separate cellulose and reusing microorganisms Immobilized cell fermentation technology produces by fermenting six- and five-carbon sugars Ethanol [18]. Therefore, rational and effective utilization of straw waste can achieve The concept of circular economy that turns waste into treasure.
Zhang Yun et al. [19] used wheat straw as raw material and carried out supercritical extraction. Take pretreatment technology, completely chlorine-free bleaching technology and microcrystalline cellulose refining Research on technology, etc., to explore the preparation of wheat straw microcrystalline cellulose method. The results show that microcrystalline cellulose prepared from wheat straw straw Comply with various standards of microcrystalline cellulose for synthetic leather.

1. 5 Corn Cobs

Corn cob is the fruit axis of the corn ear after removing the kernels. It is mainly composed of Composed of cellulose, hemicellulose and lignin, it is an agricultural by-product things. Corn cobs are used not only for cultivating edible mushrooms, preparing furfural, and producing wood. Except for products such as sugar alcohols, a large part of them are directly burned, resulting in Serious waste of resources and environmental pollution. Waste corncobs can be widely Widely used in food, feed and chemical industries, and used in production Xylitol and furfural are currently commercialized and have high economic benefits.
Xylitol is a five-carbon sugar alcohol that can be used as a sugar substitute to protect the liver Good medicine, oral health medicine, etc. At present, the production of xylitol is mainly focused on chemical synthesis. However, due to the complex process, high cost and pollution, Serious, resulting in restrictions on its production, so bioconversion methods to produce wood Sugar alcohols have become a hot spot in current research [20]. Zhang Feiwei et al [21] by Waste corn cobs are used as raw materials. By studying its hydrolysis conditions and its water The conditions for the production of xylitol by hydrolyzate fermentation were used to prepare edible xylitol. If it is found that the utilization effect of waste corn cobs is good, it can also reduce environmental pollution.

Furfural and its derivatives are important chemical raw materials. Corncob is currently the main raw material for the industrial preparation of furfural. Proper processing of waste corn cobs can produce high-quality Good furfural and its derivative compounds. Li Zhisong et al [22] Furfural was prepared using corn cobs as raw material. It was found that furfural was prepared using a two-step method. The yield can be increased 5% ~ 8% (based on raw corn cobs), its reaction The time is shortened and the amount of water vapor used is reduced.

1.6 Vegetable Tannins

Plant tannins are rich in resources, cheap and easy to obtain in agriculture and forestry. natural polymer compounds with active chemical properties, but many plants Ning was incinerated as waste, causing serious environmental pollution. dye. Tannin molecules contain multiple ortho-position phenolic hydroxyl groups, which can serve as a A complex reaction occurs between polyradical ligands and metal ions, and the complexes The ions have large mass and strong hydrophobicity, making them easy to separate from water [23]. Therefore, plant tannins can be used as adsorbent materials to remove metal ions from wastewater.

Wang Qingmei et al. [23] used waste aromatic tannins to treat wastewater and studied its removal effect on heavy metal ions. The results proved that the removal rate of aromatic tannins on heavy metal ions in water can reach up to 65% ~ 90%. Huang Hukuo et al. [24] acylated modified larch bark, a forest product waste, to prepare biomass oil-absorbing materials. The results showed that as the product particles became smaller and the acylation modification time increased, the capillary adsorption increased. As the degree of acylation modification increases, the oil absorption performance of the product also increases.

Plant tannins have strong oxidizing ability and can be used in tanning As a biological antioxidant, it can be used in the retanning process of chrome tanned leather. to prevent damage to the leather Trivalent chromium is oxidized to 6 Valent chromium can also be 6 price Chromium is reduced to low toxicity or non-toxic 3 valent chromium, thereby removing it from the leather of 6 Valent chromium [25]. In addition, vegetable tanning agents are biodegradable and Regenerating natural resources is essential for the rapid development of clean tanning today. is essential.

1. 7 Others

There are many kinds of agricultural and forestry biomass wastes in nature. In addition to the above In addition, plant hemicellulose, soy protein, sugarcane bagasse, peanut vine, rice husk and sawdust and other wastes have good development potential, and their Reasonable resource utilization will effectively reduce the impact of biomass waste on The degree of environmental pollution can also make the development of biomass in our country more beneficial. Use to reach new heights.

2 WASTE SKIN COLLAGEN

Collagen is the most important biomass material in animal bodies and is used in tanning. The main raw material for industry. As a major country in the tanning industry, China It occupies an important position in the national economy, but while creating economic benefits At the same time, corresponding pollution was also produced. According to statistics, the utilization rate of raw leather in the tanning industry is very low, and generally only raw leather can be produced. 20% of finished product leather, but will produce 60% of solid waste skin collagen is produced every year in China produces approx. 1.4 million t of skin collagen scraps, which are harmful to water bodies, soil and The atmosphere has caused serious environmental pollution [26]. With natural resources As global ecological problems such as the environment become increasingly severe, the tanning industry will also face the challenge of “ sustainable development strategy ” [27]. how to Utilize waste leather and collagen resources to achieve sustainable development of the tanning industry Development has become a top priority for the industry. Make the most of waste Leather collagen minimizes pollution and is the sustainable development of modern tanning industry. The only way to develop.

Therefore, the resource utilization of waste skin collagen has become a trend at home and abroad. One of the important topics that tanners and environmentalists pay attention to and study hard, leather collagen is a cheap industrial raw material rich in protein. Utilizing this resource to develop high value-added products not only saves biomass source and protect the environment. In recent years, waste skin collagen has been flocculated The importance and economic status of its application in industries such as agents, aldehyde removers, adsorbents, scale inhibitors, compound agricultural fertilizers, leather and papermaking are increasingly prominent [28-32].

Wang et al. [29] used waste skin collagen as raw material to prepare a collagen paper sizing agent with excellent sizing properties. It should The results show that paper sized with modified collagen sizing agent The fibers on the surface of the paper become obviously compact, orderly and smooth, and the heat of the paper Improved stability. Qiang Xihuai et al [30] A new protein-based antiscalant was prepared using waste skin collagen as raw material. The results show that the antiscalant It has excellent calcium phosphate scale-inhibiting properties and can be used as collagen for tanning leather. Exploring a feasible way to utilize resources and develop new efficient scale inhibitors Reasonable technical methods.

3 OUTLOOK

With the rapid development of biomass resource utilization technology, China's environmental protection As the environmental pollution problem becomes increasingly serious, the resource utilization of biomass waste Application is getting more and more attention from various industries. In today's sustainable development Today, the industrialization of biomass waste resource utilization technology is The inevitable trend of development, biomass waste will have broad applications Prospects, the environmental impact of solid waste on the atmosphere, water bodies and soil Pollution will be gradually resolved.

(1) With the rapid development of China's transportation industry, petroleum China's import dependence continues to increase and international oil prices continue to rise. China's biomass energy will focus on developing into vehicle fuel. biomass Waste liquefaction is an inevitable trend in controlling environmental pollution and developing industry. Potential, processing agricultural and forestry biomass waste to prepare fuel through various technologies Ethanol will be the solution to China's fuel shortage and the resource utilization of agricultural and forestry waste An effective way to discard waste. (2) With the rapid development of the construction industry, floor heating pipe manufacturers The rise of floor heating construction companies and the proliferation of floor heating construction companies have made floor heating popular. The development has entered a mature stage. Based on waste leather collagen, it is non-toxic, harmless and cheap. It is easy to obtain, environmentally friendly and has a certain foaming function. It can remove waste leather glue Originally used in concrete, it plays the role of heat preservation and insulation, and becomes an important raw material for floor heating, effectively realizing " turning waste into treasure" ", produces Huge economic benefits.

With people's continuous improvement of biomass waste resource utilization technology, With continuous exploration and research, we will find more, more stable and more practical comprehensive utilization production technologies, and biomass waste will no longer become a problem in China's environment. pollution problems, and will have a broader impact in various fields Prospects.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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