

Design of the Element Support System for the Development of the Bio-based New Material Industry under the Background of Carbon Neutrality Taking Bengbu City as an Example

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Abstract

With the country's emphasis on carbon neutrality and related work, as well as the implementation of relevant development plans, as strong support for promoting carbon neutrality and development, the development of the Bio-based new materials industry is getting faster and faster. With the development of the industry, governments at all levels, as a government that helps the development of the industry, are facing a series of problems such as how to provide corresponding and appropriate supporting elements for the rapid development of the local Bio-based new materials industry. Starting from the development status of China's Bio-based new material industry, combined with the development status of the Bio-based new material industry in Bengbu City, Anhui Province, the paper systematically constructs a factor support system for the development of Bio-based new material industry, which provides a theoretical reference for the development of the Bio-based new material industry.

Keywords

Carbon Neutrality; Bio-based New Materials; Element Support Systems.

1. Introduction

The 2021 government work report mentioned for the first time that solid carbon neutrality work, with the further warming of the global climate, carbon emissions continue to increase, the term carbon neutrality appears more and more in people's vision. Carbon neutrality refers to the total amount of greenhouse gas emissions directly or indirectly generated by enterprises, groups, or individuals in a certain period, and offsets their carbon dioxide emissions through afforestation, energy conservation, emission reduction, etc., to achieve "zero emissions" of carbon dioxide and curb the general trend of global warming.

While promoting carbon neutrality, Bio-based materials have developed rapidly, and Bio-based new materials represented by polylactic acid materials have emerged, which in addition to retaining degradable characteristics, generally have green, environmentally friendly, renewable raw materials, and other characteristics. The Bio-based new material industry has become a new development hotspot, its economic and environmental significance has gradually become prominent, the endogenous power of industrial development is continuing to strengthen, and it is necessary to study the element support system for the development of the Bio-based new material industry.

2. The Current Situation of the Development of China's Bio-based New Materials Industry.

2.1. Development Overview

China's Bio-based new materials industry is developing rapidly, key technologies continue to break through, product types are rapidly increasing, product economy is enhanced, Bio-based new materials are becoming a hot spot for industrial investment, showing a strong momentum of development. In 2020, the output of Bio-based new materials in China was 1.536 million tons, and the compound growth rate of China's Bio-based new materials industry since 2014 was 10.01%

2.2. Development Advantages

(1) Unprecedented policy support. China vigorously supports the development of the Bio-based new materials industry and promotes the development of the Bio-based new materials industry through laws and regulations and a series of policies. The Ministry of Science and Technology issued the "Notice for Soliciting Opinions on the 2021 Annual Project Application Guidelines for 18 Key Projects of the National Key Research and Development Plan" issued by the Ministry of Science and Technology, which pointed out that the preparation and industrialization of low-cost Bio-based engineering plastics, the development of key technologies for flame-retardant polymer materials for high-end applications, and the repeated chemical cycle of biodegradable polymer materials were selected as "advanced structures and composite materials" and "high-end functional and intelligent materials" key projects.

(2) The market scale is growing rapidly. In the consumer market of Bio-based new materials, China has a large market scale. According to relevant survey data, in 2014, the market size of China's Bio-based materials was 9.686 billion yuan, and in 2020, the market size of China's Bio-based materials increased to 17.154 billion yuan, and the compound growth rate of China's Bio-based materials industry since 2014 was 10.01%, and it is expected that China's Bio-based new materials industry will continue to maintain a state of rapid growth in the future.

(3) The advantages of industrial technology are highlighted. China's Bio-based new material manufacturers continue to increase technology research and development and have a leading position in the world. Taking Bengbu City as an example, Bengbu City has created several technological innovation platforms such as the National Engineering Research Center for Fermentation Technology, overcome technical problems such as high-optical pure lactic acid preparation, propylene glycol purification, polylactic acid synthesis, etc., cultivated several industry backbone enterprises led by Fengyuan Group, gathered several scientific and technological achievements such as Liv Biofuran Polyester, and formed an industrial technology development chain represented by polylactic acid, polybutylene succinate, furan polyester, and wood-plastic composite materials.

(4) The advantages of the scope of application are gradually expanding. Bio-based new materials are constantly being proven to be used in many ways. From daily necessities such as packaging bags and tableware in daily life to biomedical materials and drug control release materials with high technical content and high added value to bone fixation materials, Bio-based new materials have a broad space for the application.

2.3. Development Disadvantages

(1) Lack of top-level design for industrial development. Although the development of the Bio-based new material industry is relatively fast, there are still deficiencies in the top-level design of the industry, and governments at all levels lack clear and specific planning for the development of the Bio-based new material industry, which can easily lead to a lack of strength

in the late stage of the development of the Bio-based new material industry, and it is difficult to continue to grow healthily.

(2) The technology in the application field needs to be broken. The theoretical application scenarios of Bio-based new material products are very broad, but at some specific levels, Bio-based new material products still fail to meet the corresponding needs, affecting the promotion and application of Bio-based new material products, and Bio-based new material products still need to achieve further breakthroughs in the application field technology.

(3) There are no well-known brands. At present, China's Bio-based new materials industry has not yet formed a leading brand, the brand word-of-mouth effect is not obvious, it is difficult to better achieve product publicity and promotion with the help of brand power, and the overall social awareness of Bio-based new materials is still small.

(4) Lack of third-party evaluation criteria. At present, the production of Bio-based new materials is mainly by the internal standards of enterprises and foreign standards for production, and there is no clear and unified evaluation standard and system in China, which is not conducive to the standardized and large-scale development of the industry. At the same time, Bio-based new material products are often produced and sold concerning the product standards of traditional materials, which is difficult to reflect the characteristics of Bio-based new material products.

(5) There is a shortage of professional talents. Although the number of employees in China's Bio-based new materials industry is increasing, technical, research-oriented, and compound talents are still in short supply, and they cannot meet the demand for talents in the Bio-based new materials market. At the same time, the professional skills and knowledge reserves necessary to enter the Bio-based new material industry are also important factors that lead to the decline of talents in the Bio-based new material industry.

3. The Design of the Support System for the Industrial Elements of Bio-based New Materials.

From the national Bio-based new materials industry development status is not difficult to see, China's Bio-based new materials industry development is still in the initial stage, although there is a certain foundation for development, there are still many problems as a whole, in addition to the regional development balance, other problems are also common in the development of China's provincial and municipal Bio-based new materials industry. Bengbu City, Anhui Province, should make full use of its advantages to clarify the development orientation of the Bio-based new material industry, and its development direction should be adapted to the national level. Therefore, combined with the relevant literature and the actual situation in China, considering the regional characteristics of Bengbu City, Anhui Province, and according to the decomposition of the relevant supporting elements of the Bio-based new material industry, this paper designs the "TRAM" element support system architecture for the development of the Bio-based new material industry in Bengbu City, Anhui Province from the four key links of technology(Technology), resource (Resource), application (Application) and management (see Figure 1). Among them, technology and resources are the basis for the development of Bio-based new materials industry in Bengbu City, Anhui Province, and constitute the input layer of the architecture system; application is the output of the Bio-based new material that plays a role and has an impact, and is the output layer of the architecture system; management mainly refers to the government's planning guidance, operation management and supervision in the process of developing the Bio-based new materials industry, and management is included in the performance layer of the architecture system.

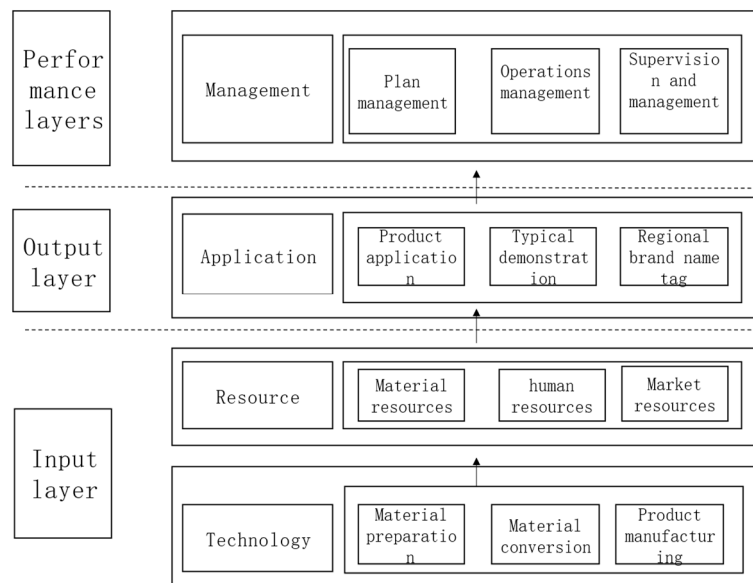


Figure 1. Element support system architecture for the development of Bio-based new material industry

3.1. Technology

The technology of the Bio-based new materials industry is not a single technology, which not only includes the preparation of materials but also includes several technologies such as material conversion and product manufacturing.

(1) Material preparation. Taking polylactic acid, a Bio-based new material, as an example, it often starts from the processing of some biological products such as straw, starch, etc., generates lactic acid through microorganisms, and then polymerizes and molds to obtain polylactic acid, which involves more complex technology and is one of the key technologies of Bio-based new materials.

(2) Material conversion. From Bio-based new materials to Bio-based products, it is also necessary to transform Bio-based new materials into materials that can be applied in products through specific research on different materials, which is one of the important technologies for applying Bio-based new materials to practice.

(3) Product manufacturing. Bio-based new material products are often different from the properties and use of old production materials, when manufacturing Bio-based new material products, it is often necessary to use new technologies dedicated to Bio-based new material products are often different from the properties and use of old production materials when manufacturing Bio-based new material products, it is often necessary to use new technologies dedicated to Bio-based new materials to promote the efficient use of Bio-based new materials in product manufacturing, and product manufacturing technology is one of the basic technologies for the application and transformation of Bio-based new materials.

3.2. Resource

The development and application of resources is the foundation of the development of the Bio-based new material industry, and the main resources include material resources, talent resources, and market resources.

(1) Material resources. The production of Bio-based new materials requires a large number of biological products such as straw and starch as raw materials, and at the same time, resources such as electricity and water are still needed in the production process, and the development

of the Bio-based new material industry is inseparable from the strong support of material resources.

(2) Human resources. The human resources here are different from the labor resources, the Bio-based new material industry belongs to the emerging material industry, with the characteristics of high technology, so the human resources related to the Bio-based new materials are more directed to the high-level talents with the professional knowledge and skills of the Bio-based new materials, and do not include manual laborers, but also mainly refer to the special intellectual resources involved in the technology and application of the Bio-based new materials industry.

(3) Market resources. Bio-based new materials are essentially commodities, need to achieve their ultimate value in the market exchange, while Bio-based new materials production enterprises also need to sell products to obtain profits, to achieve sustainable development, and as an emerging material industry, the size of the market, acceptance has become the focus of attention, so the Bio-based new materials market is a very important resource for industrial development.

3.3. Application

In November 2019, the Bengbu Municipal People's Government issued the "Work Plan for Promoting the Development of Bio-based materials industry in Bengbu City", which proposed to strengthen the promotion and application of Bio-based new material products from three aspects: promoting product application, promoting typical demonstrations, and creating regional famous brands.

(1) Promote product application. By formulating annual work goals and key tasks, strengthening supervision and assessment, while promoting the withdrawal of non-degradable materials from the market, replacing 100% disposable non-degradable plastic products, and promoting the use of Bio-based new material products.

(2) Promote typical demonstrations. Formulate and promulgate a catalog for the promotion of Bio-based products, include Bio-based new material products in the government procurement catalog, and carry out pilot demonstrations of the promotion of Bio-based degradable plastic products in the party and government organs at all levels, large shopping malls, and other places. Actively promote the introduction of product promotion policies and expand the market space for Bio-based new material products.

(3) Create regional brands. Accelerate the cultivation of Bio-based new material industry brands, promote the establishment of Bio-based new material product labels, increase Bio-based new material labels in the national environmental protection products, ecological product design, star-rated hotels, national A-class tourist attractions, and other certification systems, and declare well-known trademarks in China.

3.4. Management

Management refers to the management functions to be performed by the government, enterprise entities, and other relevant institutions in the development process of the Bio-based new material industry, and the effective management of the industry generally requires the joint participation of the government, enterprise entities, and other relevant institutions. The management of the Bio-based new material industry in Bengbu City, Anhui Province, should be based on the national strategy, mainly including planning management, operation management, and supervision and management.

(1) Plan management. Planning management mainly refers to the planning and management of the industry, based on national strategic planning, policies, and regulations, positioning the Bio-based new material industry from the industrial height, combining regional characteristics for

the development of the Bio-based new material industry for scientific special planning and formulating specific and feasible action plans.

(2) Operations management. Operation management is mainly the operation management of Bio-based new material production enterprises, which is embodied in the organizational management mode of production enterprises, the enterprise revenue model (business model), and operational effectiveness.

(3) Supervision and management. Supervision and management are mainly to supervise and manage the behavior of Bio-based new material production enterprises and related entities, and also includes the supervision and evaluation of the effect of the first two management contents.

4. Conclusion

As a new type of material, Bio-based new materials have the characteristics of carbon emission reduction, green, environmental friendliness, and renewable raw materials, and are increasingly respected by governments. Around this cutting-edge technology and industry, Bengbu City, Anhui Province, should give full play to its location advantages, actively cultivate and layout the Bio-based new material industry, accelerate the application of Bio-based new materials, and grasp the opportunity for future industrial development. Based on analyzing the development status of Bio-based new materials in China, combined with the strategic positioning of Bengbu City, Anhui Province, this paper clarifies the development direction of the Bio-based new material industry in Bengbu City, Anhui Province, and based on the division of input layer, output layer and performance layer, from the four key links of technology, resources, application and management, the "TRAM" element support system architecture for the development of Bio-based new material industry in Bengbu City, Anhui Province is designed, and the construction of the support system provides a certain theoretical basis for how to develop the Bio-based new material industry in Bengbu City, Anhui Province. In addition, the factor support system proposed in this paper for the Bio-based new material industry in Bengbu City, Anhui Province, can provide a useful reference for some areas with similar resource endowments, can alleviate the imbalance in the regional development of China's Bio-based new material industry to a certain extent, and promote the balanced development of the Bio-based new material industry, which is conducive to enhancing the comprehensive competitiveness of China's Bio-based new material industry and narrowing the gap with developed countries.

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