Development and Research of Global Science and Technology Innovation Situation of Micro-Chemical Technology

Ji Xiyan, Wang Meirong, Liu Lijing

Chemistry Department of Baotou Teachers' College, Baotou, Inner Mongolia, China

Keywords: Micro-Chemical Technology, Geographical Distribution, Institutional Competition, Patent Analysis

Abstract: with the Further Advancement of Economic Globalization, Chemical Technology Has Developed Rapidly. as the Cutting-Edge Technology in the Chemical Industry, Micro-Chemical Technology Has a Prominent Role in the Controllability, Safety and Efficiency of the Experiment. Compared with Other Developed Countries, China's Micro-Chemical Technology Patents Have a Weak Global Layout Awareness and Lack of Competition Awareness, and There is Still a Lack of Core Innovation Technology. Based on This, This Paper Analyzes the Regional Distribution of Patents, the Status Quo of Research Institutions, and Key Patents, and Then Studies the Global Technological Innovation of Micro-Chemical Technology, in Order to Provide Reference for the Development of China's Chemical Industry.

1. Introduction

1.1 Literature Review

Zhao Shanda Believes That in the Development and Research Process of Micro-Chemical Technology, the Concept, Research Process, Development Principle and Technology Application of Related Micro-Chemical Technology Have Been Deeply Understood, Further Promoting the Development of Micro-Chemical Technology and Improving People's Technology for Micro-Chemicals. Application Level (Zhao, 2019). Jia Airong, Yuan Wenpeng and Zhang Yonggang Pointed out That under the Current Situation, There is Fierce Competition in Bioinformatics At Home and Abroad. by Studying Relevant Bioinformatics Development Strategies, It is Possible to Provide Scientific Basis and Relevant Policy Recommendations for the Development of Microchemical Technology (Jia and Yuan et al., 2015). Hu Shaohai Believes That the Development of Micro-Chemical Technology in China is Relatively Short. Since the 1990s, the Development of Micro-Chemical Technology Has Been Widely Used in China's Chemical, Materials, Machinery and Other Fields (Hu, 2013). Li Jinying, Wang Xunzhang, Zhao Yingcui and Others Believe That the Micro-Chemical Technology Field, as the Frontier of Science and Technology, Involves the Design of Mems, the Basic Principles of Chemistry and Chemical Engineering, and the Emerging Technologies Formed by Integrated Circuits and Sensor Manufacturing. Strategy Has a Huge Driving Effect (Li and Wang et al., 2011). Liu Minmin Pointed out That with the Further Advancement of Science and Technology, a Large Number of Advanced Science and Technology Have Been Applied in Chemical Research. as a New Modern Technology, Micro-Chemical Technology Has Made Outstanding Contributions in Various Fields in China, and Studied the Performance of Micro-Chemical Technology in Chemical Reactions. to Further Develop Micro-Chemical Technology (Liu, 2016). Jia Hongliang Believes That the Emergence of Micro-Chemical Technology Conforms to the Trend of Scientific and Technological Development. by Integrating Micro-Thermal, Micro-Reaction, Micro-Separation, Micro-Analysis and Other Systems, Micro-Chemical Technology is More Focused on Efficiency and Simplification in the Experimental Process. Convenience and Integration Have an Important Impact on the Development of the Chemical Industry (Jia, 2016). Peng Chuan Believes That Micro-Chemical Technology is One of the Research Hotspots under the Current Technological Innovation Trend. Micro-Chemical Technology Plays an Important Role in Strengthening the Safety of Chemical Processes and

  DOI: 10.25236/iwass.2019.234

Promoting the Simplification of Chemical Systems (Peng, 2016). Wang Sen Believes That the Development of Science and Technology Has Led to the in-Depth Study of Chemical Technology. the Application of Micro-Chemical Technology Has Made the Practice Results in the Chemical Reaction Process Continue to Improve. with the Continuous Application of Micro-Chemical Technology, the Micro-Chemical Technology Should Be More and More Mature (Wang, 2017).

1.2 Purposes of Research

As a cutting-edge technology in chemical technology, micro-chemical technology has opened up new research paths for the production, optimization and design process of chemical synthesis processes because of its high production efficiency, fast rate, high controllability and low industrialization risk. Li and Yu et al., 2018). Since the 1980s, many European and American companies have used micro-chemical technology to achieve great achievements in the fields of bio-pharmaceuticals and chemicals. Through the publication of the patent literature, it can clearly reflect the latest scientific and technological inventions in the relevant technical fields, and can also understand the academic development trends in related fields, and has important guiding significance for mastering the research and market layout of competitors. At present, China National Science and Technology University, South University of Technology and other scientific research institutes are pioneers in the field of micro-chemical technology in China. However, in the field of micro-chemical technology, there are still problems such as the core technology field lags behind the developed countries in the West, and the global layout awareness of micro-chemical technology patent technology is weak. It can be seen that the development of China's micro-chemical technology in the core technology accumulation, the lack of patent layout affects the development of China's micro-chemical technology. In response to this, through the analysis of global micro-chemical technology innovation, as well as patent layout applications, scientific research and other directions, in order to provide guidance and reference for the follow-up development of China's micro-chemical industry.

2. Analysis of Geographical Distribution of Micro-Chemical Technology Patents

As of the beginning of 2019, a total of 49 countries' micro-chemical technology patent holders have carried out international patent distribution, radiating 43 countries and regions around the world. According to statistics from relevant research institutions on patents that can be retrieved, the global distribution of patents can be clearly grasped, and the application flow and application areas of new patents can be grasped, and the patent applications of different countries as well as the status quo and market layout of global technology development can be understood. According to the distribution of patent applications in micro-chemical technology, in addition to the World Intellectual Property Organization and the European Patent Office, China, Japan, Canada and other countries are the main application countries for micro-chemical technology patents, and the applications in other countries are all below 200. It can be seen that China, Japan, Canada and other countries are the key patent geographical regions, and the patent competition in this region is relatively strong. It can be seen from Figure 1 that the development status of patent technology is at the forefront of developed countries such as Europe and the United States. The development of patent technology in Asian countries such as China, Japan and South Korea is second only to Europe and the United States. Among them, the number of patents far exceeds that of other countries. The source countries of patent technology are mainly China, Germany, Japan, and the United States.

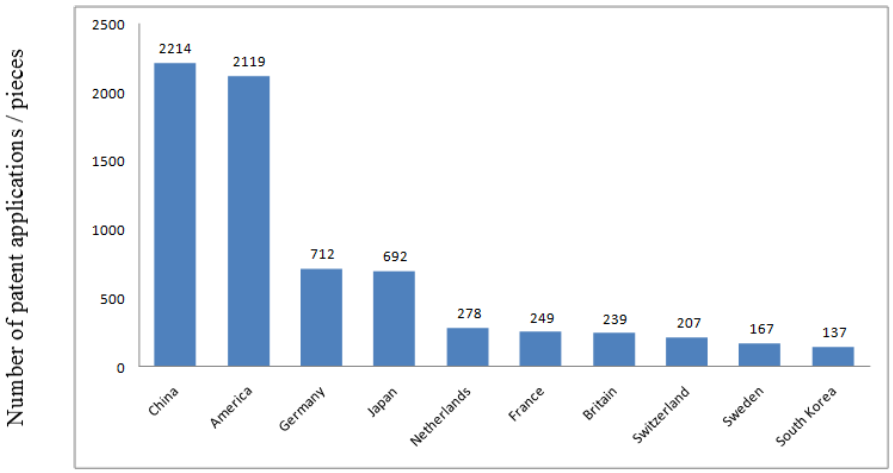

Fig.1 Distribution of Micro-Chemical Technology Patent Applicant Countries (Technology Source Countries or Regions)

Relevant research institutions have conducted statistics on the patent flow of micro-chemical technology worldwide. It is found that developed countries such as the United States and Japan not only attach importance to the development of patents within their own countries, but also attach great importance to the distribution of patents in organizations such as the World Intellectual Property Organization, the European Patent Office, and countries such as Canada, South Korea, and China. Covering many countries with promising global prospects. China is more inclined to pay attention to the application of national patents. The Netherlands, Germany and other countries are mainly based on the international market. Comparing and analyzing the patent applications of China and the United States, we can see that the layout of China's patents is relatively narrow, involving only six countries and regions except China. The number of Chinese patent holders is about 97% of the total number of applications in China. The US patent distribution covers 24 countries around the world, and domestic patent applications only account for 26% of the total number of patents. It can be seen that China's global patent distribution awareness is weak and needs to be strengthened.

3. Analysis of Competition Status of Micro-Chemical Technology Research Institutions

It is very important to analyze the competitiveness of a certain field and analyze the competition of research institutions. According to the latest data, the top ten micro-chemical technology research institutions are Wanrosais, Corning Co., Ltd., Battelle Memorial Research Institute, GYROS Patent Company, Shell Company, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Gary Per Life Science Co., Ltd., Merck, Tsinghua University, Nanjing University of Technology. Among them, Chinese research institutions accounted for 30%, while American research institutions accounted for 50%. It can be seen that in the field of micro-chemical technology, the United States is still in a core innovation position, and its technological strength cannot be underestimated.

China has a short time to enter the micro-chemical technology field, and China is still in the basic research stage at this stage. The patent right holders are mainly universities or scientific research institutes, and there is still a certain distance from the global layout of industrialized patents that form the system. According to the latest research institute patent application time and regional report, the development of patent application time and patent layout of China's overall research institutions lags behind other developed countries, so Chinese research institutions are less competitive globally. From the analysis of the application area distribution, the top 10 US patent holders have carried out a large number of global patent layouts, especially for the major markets of micro-chemical technology development in China, Australia, Europe and so on. For example, the top micro-chemical technology research institutions such as Corning Co., Ltd., Van Roths, and Shell have also carried out a large number of patent layouts in China. Compared with patent applications of patent holders in other countries in China, China's domestic micro-chemical technology research

institutions have an absolute advantage, but in other countries, Chinese patent applications are still relatively rare. Through the comparison of patent layouts between Chinese and American research institutions, it is known that China still lacks planning for the international patent market layout, and the international micro-chemical technology competition awareness needs to be further strengthened.

4. Micro-Chemical Technology Key Application Patent Analysis

The more citations of patents, the wider the scope of application of this patent, and the reference for many patent applicants. The influence of these patents reflects the core level of patent right holders' mastery of innovative technologies. According to available data, the top 20 patents cited by the world are attributed to the United States. Among them, the patent “micro-component chemical process table structure” is quoted up to 500 times, and the patent “method and product for analyzing polymer” is cited only second to the “micro-component chemical process table structure”. In addition, the US micro-chemical technology research institute has 11 patents cited in the top 20. It can be seen that in the field of micro-chemical technology, the United States holds the core innovation technology of micro-chemical technology and is in a leading position.

Through the analysis of the transaction database, it is known that in the field of micro-chemical technology, a total of 54 transactions occurred, including 62 patents, 20 micro-chemical technology research institutions, and 8 patent holders. The US micro-chemical technology research institute has issued 21 foreign licenses and accepted 48 licenses. It can be seen that the United States attaches more importance to technical security. Due to factors such as secrecy and protection of the domestic market, it mainly focuses on self-innovation and self-development, and the transaction license between US companies is relatively rare.

Key application patents may also involve litigation cases. Although long-term litigation will take a lot of time to prepare, and legal advice will result in expensive litigation costs, patents involving long-term litigation may represent the most valuable core technology for patent holders, so many rights holders are willing to invest time. With the funds to obtain the ownership of the patent. According to the US Patent Litigation Library, there are 11 lawsuits in the field of micro-chemical technology patents, involving multiple patents of micro-chemical technology research institutions in the United States, such as multilayer microfluidic devices and channel sizes of microfluidic systems. Among them, there are even litigation cases that take up to 13 years. It can be seen that the core patent has a high comprehensive value, and the United States often uses patent litigation to protect its patent rights.

Acknowledgement

This research has been financed by The Project of National Natural Science Foundation of China in 2017 “Integration of Advanced Treatment and Resource Utilization for Phosphorus, Nitrogen and Magnesium Removal from Rare Earth Smelting Wastewater”(21767021); Inner Mongolia Autonomous Region University Scientific Research Project in 2017 “Study on the Preparation and Emulsion Process of Emulsion in Microreactor”(NJZC17288)

References

[1] Zhao S.D. (2019). Research and Application of Micro Chemical Technology, Chemical Design Communication, 45(03), 160+193.

[2] Jia A.R., Yuan W.P., Zhang Y.G., et al. (2015). Research on Competitive Situation and Corresponding Measures of Bioinformatics Technology Development in Shandong Province, Science and Technology Innovation Guide, 16(4), 62-62.

[3] Hu S.H. (2013). On the Development of Micro Chemical Engineering Technology, Science and Technology Innovation and Application, 9(19), 73-73.

[4] Li J.Y., Wang X.Z, Zhao Y.C., et al. (2011). Research and Application of Micro-Chemical Technology, Chemical Technology, 28(01), 76-80.

[5] Liu M.M. (2016). Application Analysis of Micro-Chemical Technology in Chemical Reactions, Chemical Management, 32(19), 219-219.

[6] Jia H.L. (2016). Research and Application of Micro-Chemical Technology, Chemical Management, 32(16), 213-214.

[7] Peng C. (2016). Analysis on the Application of Micro-Chemical Technology in Chemical Reactions, Contemporary Chemical Research, 19(2), 33-34.

[8] Wang S. (2017). Research and Analysis of Micro-Chemical Technology, Chemical Design Communication, 45(8), 72-72.

[9] Li Y., Yu L.X., Zhang H. (2018). Research and Application of Micro-Chemical Technology, China Petroleum and Chemical Standards and Quality, 39(10), 173-174.