

Research status and hot spot visualization analysis of "gas safety" based on CiteSpace

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Abstract. Taking "gas" and "safety" as the theme, this paper adopts bibliometric method and visual analysis method, and makes use of CiteSpace software to analyze the current research situation in the field of domestic gas safety in terms of keywords, authors, institutions, etc. , understand the research process hot spots and risk points, in order to better promote gas safety management. The results show that at present, there are many hot spots in gas safety research, especially in safety management. Many excellent authoritative scholars published papers, some of the key authors have initially established a small-scale literature cooperation network and close contact. In contrast, the agency appears slightly single, the research force is more scattered. More universities should be encouraged to participate in research on related topics, and inter-agency cooperation and exchanges at a deeper level should be strengthened to share development results and gradually form stable cooperation clusters.

1 Introduction

With the continuous expansion of gas application market scale, China has entered the gas era, and is currently in the critical period of energy structure transformation and in-depth development. City gas has good potential value and can provide a good internal driving force[1] for energy structure transformation and further development. However, due to the characteristics of flammable, explosive and toxic gas, once the facilities leak, fire and poisoning accidents are easy to occur. Statistics show that in 2019 gas accident news a total of 722, related casualties: 63 people were killed and 585 injured. In this context, gas safety research is particularly important, widely concerned by scholars. In recent years, gas safety related research has been extensive and hot research branches are numerous. At the same time, the diversity of research centers also provides a strong theoretical basis for safety management and security system. It is helpful to further improve the quality of gas safety management in China. CiteSpace software is used to visualize the gas safety field in 2010-2019 to understand the research hot spots, development trends and frontiers in this field.

2 Consequence

2.1 Time distribution

Figure 1 shows the number of thematic literature published in each year. In the past ten years, gas safety related research has been carried out continuously, and the volume of communications has generally shown a steady upward trend. In 2017 and 2019, it reached a peak

state, with a maximum of 245 articles.

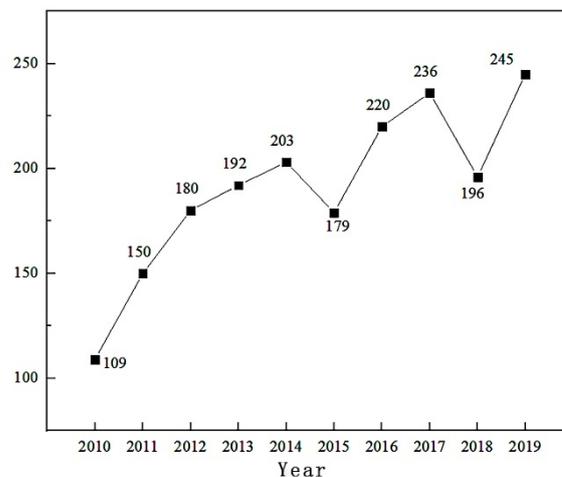


Figure 1. Gas safety literature published from 2010 to 2019.

2.2. Analysis of key words

CiteSpace provides a combination of keywords and terms, Can explore a certain field of common concern of scholars topic[2]. This means that the research focus or focus topic in a certain period can be reflected by high frequency keywords. In the circle link mark, according to its internal width and color, the frequency[3] of node content in each time stage can be represented. Figure 2 shows the results of keyword visualization analysis in 2010-2019, with 353 nodes, 510 connections, density of 0.0082. Where the size of the node represents the frequency of keywords, Figure 2 shows gas safety (306

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the cooperation is formed in the form of point-to-face research. Network can strengthen research in the field of gas safety.



Figure 4. Co-appearance of authors.

2.4 Analysis of publishing institutions

As a new perspective to evaluate the academic influence of scientific researchers, countries or institutions, the cooperation map intuitively shows the social relations between scholars in a certain research field, countries or research institutions[8]. After Node types are set to institution to run the software, the co-occurrence diagram of research institutions is obtained, as shown in Figure 5. The nodes in the figure correspond to the institutions one by one, and each color value on the time axis determines a unique year, which corresponds to the color of the node outline in the cooperative co-occurrence network. Combined with the analysis of Table 3, it is found that the research network branch covered by Beijing Gas Group Co., Ltd. and Beijing University of Civil Engineering and Architecture has a wide and dense coverage, which indirectly promotes Tianjin Gas Group Co., Ltd., Shaanxi Datang Intelligent Instrument Co., Ltd. and Beijing Municipal Engineering. The academic exchange and communication of the Central Design Research Institute Co., Ltd. Based on the analysis of the number of publications, the institutions with the most publications are Chengdu Qinchuan Internet of Things Technology Co., Ltd. (26 articles), China Municipal Engineering North China Design and Research Institute (22 articles), and PetroChina Kunlun Gas Co., Ltd. Shandong Branch (22 articles), Wuxi City Gas Management Office (21 articles), Golmud China Resources Gas Co., Ltd. (21 articles), etc. According to analysis, most of the above institutions belong to independent research status and have not tended to form cooperative groups. However, the number of published literatures is outstanding, which is still the backbone of gas safety related research.

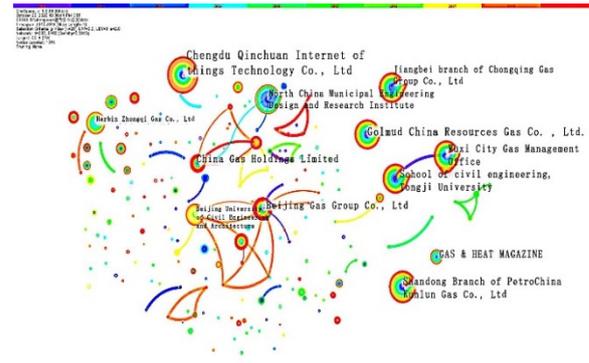


Figure 5. The co-appearance network of publishing institutions.

3 Discussion of results

This article takes gas safety as the theme, and 1913 related documents in the CNKI database from 2010 to 2019 as the research object. The CiteSpace visualization software is used to draw a scientific knowledge map. According to the research status, it is based on the three perspectives of keywords, publishing authors and publishing organizations. After an in-depth analysis, the following conclusions are drawn:

- (1) The top three keywords in frequency are gas safety, safety management and gas, and risk management and safety technology are the main emergent words. With the vigorous development of the gas industry, the importance of gas safety management has become increasingly prominent. We can strengthen the gas safety management, reduce the probability of gas accidents and reduce the loss caused by accidents by strengthening the attention, improving the safety management system, comprehensively improving the safety skills of staff and expanding the popularization scope of safety awareness.
- (2) From the analysis of the graph by the author, it can be seen that the number of articles published by a single author is relatively high, which has greatly promoted the development of the field of gas safety. Generally speaking, the cooperation between the authors is relatively lacking. High-volume authors such as Gao Jie, Guo Libin, and Peng Zaimei are all independent researchers. The authors can communicate through related academic exchanges in the gas field to promote joint cooperation and strengthen gas safety. Field of research.
- (3) From the perspective of document issuing institutions, colleges and universities and local listed gas companies are the mainstay of the research in this field. Chengdu Qinchuan Internet of things Technology Co., Ltd., North China Municipal Engineering Design and Research Institute, and Shandong Branch of PetroChina Kunlun Gas Co., Ltd. have issued outstanding papers, which are important components. Based

on the whole, the organization has not formed a certain scale of cooperation and exchange system. Beijing Gas Group Co., Ltd. and Beijing Jianshu University are the key hubs for promoting research cooperation between domestic gas safety related institutions in various provinces. Their concentrated cooperation promotes academic exchanges and common development. It is worth learning from other institutions.

Acknowledgments

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