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Analysis on core technologies and cutting-edge technologies of new energy based on input-output method

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Abstract

In this paper, taking the patent for the study and using input-output analysis method distinguish the advanced technology and the core technology in the field of new energy, which makes the number of cited patents as input, and the number of published patents as output. Patent data for this paper comes from Derwent Innovation Patents Citation Index (DII), using the Python programming language to extract the patent information in PN field and CP field for each time period and each energy sector, then matching this information in SQL database, whereby the number of one energy sector cited from another energy field. Construct the patent citations matrices to identify core technologies filed and cutting-edge technologies field by induction coefficient and influence coefficient, on this basis analyze the degree of sensitivity, to further determine which energy field makes the greater impact for the development of whole new energy field. The results show that the cutting-edge technologies field is marine energy technology research and development, the core technologies field is solar technology field, the solar technology makes the greater impact for the development of whole new energy field.

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1. Introduction

Rational development and efficiently use of energy in relation to the future of the world, today, the world is facing the challenge of population, resources, social development and environmental protection and other multiple pressures, but the traditional energy reserves are getting fewer, therefore, the national government have focus on the

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development of new energy and renewable energy, gradually reduce fossil energy use. In the perspective of globalization, the energy issue has become a key problem in international politics, economy, environmental protection and many other fields, and even become the focus of international politics. Among the world's energy hegemony has fierce competition around the world, the core interest of the country have to maintain the focus on energy security strategy to develop. Governments are actively leading the development of alternative energy sources, so energy problem is increasingly becoming the focus of international attention. Oil prices continue to fluctuate, the national focus on low-carbon economy, climate change and environmental problem, government think-tank scholars also pay close attention to people's livelihood. In the energy fields, China's international cooperation is also expanding, at the begin, oil and natural gas play an important roles, and then extended to coal, electricity, wind, biomass fuels, nuclear and other new energy sources. Chinese state-owned oil companies, assume and fulfill an important mission of political, economic and social development, and also ensure national energy security; it is also made great achievements in opening up the domestic and foreign markets. However, the energy issue is no longer a simple economic problem; it is often accompanied by complex international political, economic, social and environmental factors at the overseas development.

In the past, mainly based the CITESPACE software by cited frequency, intermediary, emergent and other indicators to identify core technologies and advanced technologies. Input-output analysis is widely used in industrial economic research, which use of the various types of indicators, to portray the input-output relationship between the various departments, reveal their interdependence, affect and interaction mode^[1]. H.Inhaber and M.Alvo from the input-output analysis perspective use published papers as an input-output system or product, and H.Eto from journal literature citations perspectives analysis the relationship between the subjects^[2]. Nomaler and Verspagen is applied the input-output analysis to the flow of knowledge, analysis the strength of different industries difference by patent reference matrix decompose into the flow of knowledge between industry and the scientific^[3]. Junna Yan, Tao Zhao through establishment of input-output model to analyze the effects depth of different industries production technology change to High energy-consuming industries CO₂ emissions intensity^[4]. García and Vicentethe have applied input-output method to the analysis of technology diffusion and economic growth in Europe in the field of information and communication technology^[5]. Jingqin Su has established the analysis framework by use of input-output analysis of APL and other methods to identify the core technology chain^[6]. Zhaohua Jiang who calculated the technical maturity of new energy vehicles used input-output analysis^[7]. Zhiqi Wang et al. Taking hybrid vehicles as an example, using input-output analysis, identification of its cutting-edge technology and core technology, and the development trend of key technology areas were analyzed^[8]. In this paper, take patent as our research target, which reference other patents as inputs or consume, published patent as output, use input-output analysis method, induction coefficient and influence coefficient discuss core technologies and advanced technologies of the new energy, at last, analysis patent changes of the technical field have sensitivity to the whole new energy field.

2. Technical principles and quantitative analysis method

According to Jingqin Su et al. about the core technology chain and other input-output analysis method as summarized the technical principles, use influence and induction coefficient etc. calculation model, introduction of technology diffusion theory, Construction diffusion effect, absorption effect calculation model, to further improve the input-output method of patented technology.

2.1. Technical induction principle

The technical field achievements, one hand come from the field itself into research, equipment, personnel and time for the results to create original and innovative; on the other hand, depending on the network technology in other technical fields of study, imitation, digestion absorption and re-innovation, it is the result of induction technology, which can be called the principle of induction technology.

The technology induction principle can be used the input-output analysis method to quantitative described, assuming technology networks in the i -th fields patent number X_i , the i -th field cited j -th field patents number is X_{ij} ;

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