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Knowledge Map on Construction of Ceramic Tableware Design

Wu Wenchao^{1,4}, Irwan Syah Md Yusoff^{2*,3}, Hassan Alli¹, Wang Heng⁴

** Corresponding Author*

¹ Department of Industrial Design, Faculty of Design and Architecture, University Putra Malaysia, 43400 UPM Serdang, Malaysia.

² Department of Resource Management & Consumer Studies, Faculty of Human Ecology, University Putra Malaysia, 43400 UPM Serdang, Malaysia.

³ MyAgeing, University Putra Malaysia, 43400 Serdang, Malaysia.

⁴ Department of Design, Faculty of Arts, North University of China, Taiyuan City, Shanxi Province, China.

371866324@qq.com, irwansyah@upm.edu.my, halli@upm.edu.my, 8223624@qq.com
Tel: 008613934576400

Abstract

The research analyzed 347 ceramic tableware design papers published in the CNKI database from 2003 to 2023 through CiteSpace, revealing the hotspots and future trends of ceramic tableware design research in the past 20 years. The study employs descriptive statistical analysis, keyword mapping, and burst detection to emphasize the critical role of metrics in future research. The graphical quantification reveals the research trends in ceramic tableware design, identifies the research gaps, challenges, and opportunities, and provides a firm reference and new ideas for future research.

Keywords: Ceramic Tableware Design; CiteSpace; Knowledge mapping; China

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1.0 Introduction

Over the last few decades, reviews on ceramic tableware design have focused on the direction of ceramic technology and the industry. However, few reviews provide a complete description of the research progress, research methods, and latest research achievements in ceramic tableware design. This research aims to conduct an in-depth analysis of 347 research papers on ceramic tableware design published in the CNKI database from 2003 to 2023. Utilizing the knowledge mapping analysis tool CiteSpace, the research goes beyond the scope of literature records. It aims to reveal critical hotspots and emerging trends that have influenced ceramic tableware design research over the past two decades. By combining descriptive statistical analysis, keyword mapping, and burst detection, this study illuminates the critical role metrics play in guiding future research directions.

2.0 Literature Review

Chinese ceramic tableware design is not merely the manufacture of everyday items but also a reflection of China's long-standing culture and exquisite craftsmanship. From the Tang dynasty's tri-colored ceramics to the Song dynasty's celadon and then to the blue-and-white porcelain of the Ming and Qing dynasties, Chinese ceramic tableware reveals the historical development and diverse cultural

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characteristics of Chinese porcelain (Ren & Wang, 2022). These ceramic tableware not only meet the functional needs of people in their daily lives but also serve as containers for artistic and aesthetic appreciation. Chinese ceramic tableware design research because of the long history of ceramic firing and use and thus, research also has a long history (Deng et al., 2022); there are many research contents through the CNKI for many research literature has a prepared digital journal data, using data for citation analysis becomes more accessible. This also makes data interpretation more intuitive, visual, and straightforward. The CiteSpace system, created by Chaomei Chen in 2004, is software used to quantify and analyze literary data (Chen, 2006; Ding & Yang, 2022). Currently, limited CiteSpace methods are available for visualizing the progression of knowledge in ceramic tableware design, focusing on analyzing research clusters. Given the continuous growth of knowledge in the discipline, it is critical to monitor progress in the field continuously. This study provides a comprehensive review of the ceramic tableware design research field in China, which can help better understand the development path of ceramic tableware design research. It can improve traditional research review methods by reducing complexity and cost. It aims to provide a comprehensive visual assessment of ceramic tableware design research and to lay the foundation for researchers to understand the tacit knowledge issues in the field effectively.

3.0 Methodology

This research adopts a literature-based scientometric analysis method, which belongs to the research category of Mapping Knowledge Domains (MKD) (Xiong et al., 2015). The advantage of MKD is that horizontal and vertical comparisons can be applied to analyze the research hotspots and development trends of different disciplinary fields, among which Citespace software developed by Prof. Chaomei Chen has been widely used in the research of MKD mapping (Chen, 2017). With "ceramic tableware design" as the subject phrase, the data search in this research is restricted to papers in the core journals of the CNKI database. The search period spans from 2003 to 2023, yielding 347 records. Three hundred twenty-six valid data points were collected after the data were cleaned, the literature was merged, and the literature was de-weighted. Citespace was used to input the 326 valid ceramic tableware design data points for statistical analysis.

4.0 Findings & Discussions

4.1 Descriptive Statistical Analysis

Figure 1 illustrates the temporal distribution of research outcomes on ceramic tableware design from 2003 to 2023. There are four stages to the research on ceramic tableware design in China: Stage 1 represents the initial phase between 2003 and 2008. At most, fifteen journal articles addressed this study during these five years, with 2006 and 2008 having the fewest relevant publications at five. Stage 2 represents the period of development from 2009 to 2015. There was a significant increase in the amount of relevant literature. In 2013, there were twenty-seven published articles. Stage 3 represents the period from 2016 to 2021, characterized by a hovering state. In 2018, there were only ten articles, while in 2021, the number peaked at 35. Stage 4 represents a period of vulnerability, which is expected to occur between 2022 and 2023. Since 2021, there has been a gradual decline in the annual publication of articles in the CNKI Database. This decline indicates that the field of Chinese ceramic tableware design has faced particular challenges in its development. Addressing the challenge of overcoming limitations and achieving progress is a pressing issue that requires immediate attention.

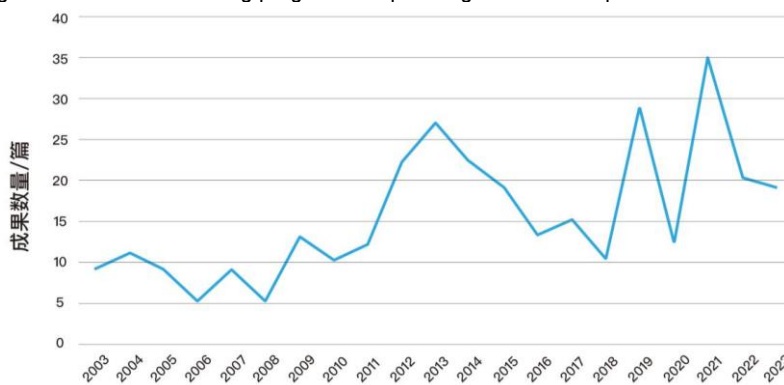


Fig 1 Time Distribution of Research results in the Field of Ceramic Tableware design from 2003 to 2023 (Source: CNKI)

4.2 Distribution of Core Authors

Knowledge mapping can help identify the distinguished authors in a field, providing valuable insights into its developmental lineage. The generated core author knowledge mapping comprises 257 nodes and 158 connecting lines. The modularity of the core author distribution knowledge mapping network is 0.7112, while the clustering average silhouette value S is 0.9243. The average silhouette value for the given data points is 0.8038. The author map in Figure 2 displays the CNKI core ceramic tableware design research from 2003 to 2023. The progress and advancement of the academic field depend heavily on the collaboration among researchers. The connections between authors are loose, as only a portion of the cooperative network is present, and the distribution density is low. Considering the quantity

of articles published by scholars, it is evident that there are few high-yield authors. This leaves ample room for young scholars to delve further into ceramic tableware design research.

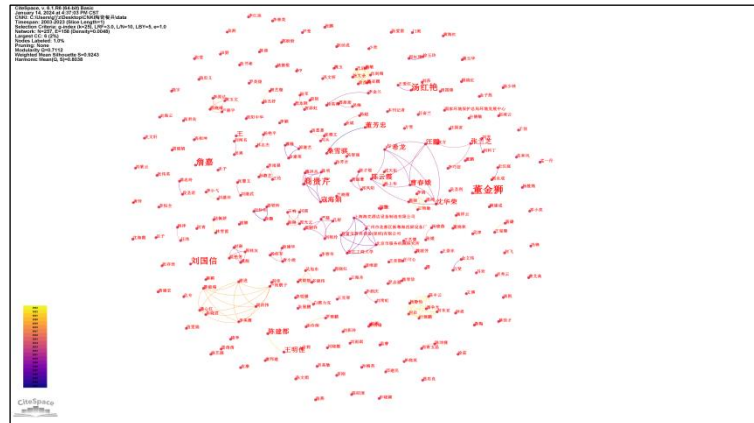


Fig. 2 CNKI Core Author Mapping of Ceramic Tableware, 2003-2023
(Source: Authors, 2023)

To delve deeper into the primary author of the work, the ceramic tableware design that received the most citations (top 10) is presented in Table 1. The article "The Impact of the New Design on the Traditional Concept of Ceramic Design" has received 28 citations, ranking it first. The essay explores a novel design that aims to defy the established principles of ceramic artistry and embraces the concept of playful innovation (Tang, 2003). It offers valuable insights and references for design enthusiasts. The analysis of the attractive ceramic tableware design has been referenced 18 times. The article focuses on two aspects: the elements of design that are of interest and the specific application of design in ceramic tableware (Wang & Tang, 2009). These extensively referenced publications are crucial for a thorough examination of knowledge in the realm of ceramic tableware design. The citation linkages between the authors and the dataset are crucial for conducting a comprehensive ceramic tableware design analysis and establishing a research network.

Table 1 Table of 10 highly cited articles in the field of ceramic tableware design, 2003-2023

No.	Article Title	Author	Year	Title of Publication	Citations
1	The impact of the new design on traditional ceramic design concepts	Tang, C.	2003	China Ceramic Industry	28
2	Analysis of ceramic tableware amorous design	Wang, A. H. & Tang, H. Y	2009	China Ceramics	18
3	Interesting Designs for Daily Ceramics	Zhang, W	2007	Foshan Ceramics	17
4	Humanized design of daily-use ceramic products	Xu, Y. L. & Cheng, H. P.	2005	Journal of Tangshan College	15
5	From the perspective of food culture to talk about the cultural design of China's ceramic tableware	Jin, W. & Wan, F.	2009	Ceramic Research	15
6	Analysis of the design concepts of British daily-use ceramics brands and revelations--an exploration of the Wedgwood brand as an example	Xiu, Y	2010	Design Art (Journal of Shandong Academy of Arts and Crafts)	14
7	The relevance of "shape," "meaning," "image," and ceramic tableware design	Liu, W. M. & Wu, S.	2015	Design	14
8	Daily ceramic tableware design based on Huizhou culture	Han, L. & Yan, Q.	2016	Art and Science	10
9	China's daily-use ceramics suffered anti-dumping reasons and coping strategies	Zhang, H. & Liu, J. W.	2013	Ceramic	9
10	From the aesthetic point of view of daily ceramic tableware design	Shen, H	2018	Ceramic Research	9

4.3 Distribution of Research Institutions

The progression of an academic discipline can be examined by considering the top ten affiliated academic research institutions, as depicted in Figure 3. These institutions, listed in descending order, include Jingdezhen Ceramic University, Jingdezhen Ceramic University College of Design and Art, Jiangxi Institute of Ceramic Arts and Crafts Vocational and Technical College, Hunan University of Technology, Nanchang University, Shenyang University of Science and Technology, Xihua University, China National Light Industry Ceramic Research Institute, Nanjing Normal University, and North China University of Science and Technology. The articles produced by academic research institutions reveal distinct patterns and regional peculiarities in terms of research themes and directions. Jingdezhen Ceramic University primarily emphasizes the study of ceramic art, art design, Jingdezhen ceramics, and contemporary pottery. Nanchang University School of Art and Design's study primarily emphasizes serialized design, ceramic art, emotive design, and

design orientation. Descriptive statistical analysis reveals that the density of core authors could be higher, indicating a need for more collaboration among scholars and research institutions.

Furthermore, no established pattern exists of scholars and institutions with interdisciplinary backgrounds participating in ceramic tableware design research. Regarding the quantity of publications by authoritative scholars, there is a need for more highly prolific professors. This is also a secondary consequence of the rapid increase in citations, which poses challenges for conducting in-depth studies. Scholars specializing in ceramic tableware design should be encouraged to collaborate in scientific research teams, build academic networks, and foster a research environment that promotes reciprocal cooperation and a virtuous cycle. The citation linkages between the authors and the dataset are crucial for conducting a comprehensive ceramic tableware design analysis and establishing a research network.

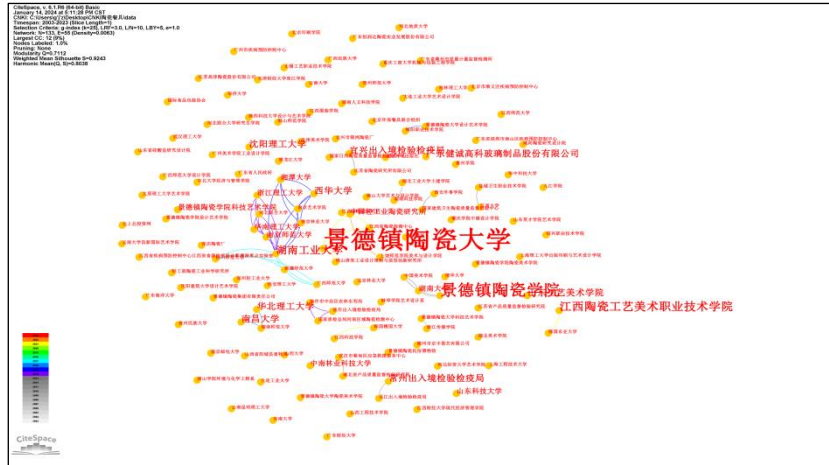


Figure 3 2003-2023 Ceramic tableware design CNKI research organization mapping (Source: Authors, 2023)

4.4 Distribution of Research Hot Areas

4.4.1 Keyword Mapping Analysis

Keywords are the fundamental vocabulary that encapsulates a specific study domain, enabling us to comprehend the trending research areas and the cutting-edge advancements within the topic area. The literature data were imported into CiteSpace software for visualization and analysis. This process resulted in the generation of 315 nodes and 767 connecting lines. Figure 4 displays the knowledge map of ceramic tableware design study subject phrases from 2003 to 2023. The knowledge clustering map of this study reveals that the network has a modularity degree of 0.7112.

Additionally, the average silhouette value (S) of 0.9243 and the average silhouette (Q, S) of 0.8038 shows that the clusters have high homogeneity. Based on the study above, it can be inferred that the keyword co-citation clusters are both plausible and substantial, possessing a high level of reference value. The cluster identifiers, listed in descending order of node size, are as follows: ceramic tableware, design, anti-dumping, traditional culture, bionic, ceramics, formulation, application, lacquerware, cultural and creative items, and the Wedgwood trademark.

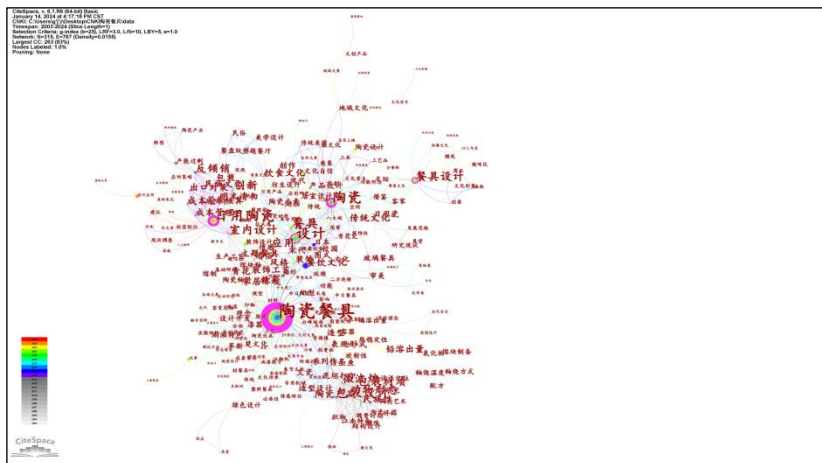


Fig. 4 Keyword mapping analysis of ceramic tableware design 2003-2023 (Source: Authors, 2023)

Particularly notable is the emphasis on traditional culture and the Wedgwood trademark, underscoring the field's engagement with historical legacies and brand heritage within ceramic tableware design. This reflects a deep-seated appreciation for the cultural and historical context that shapes ceramic tableware design, alongside recognizing the importance of branding and market positioning in contemporary design practice.

Furthermore, the focus on anti-dumping research signifies the field's responsiveness to global trade dynamics and the challenges faced by ceramic producers in navigating international markets. This suggests that ceramic tableware design research addresses aesthetic and functional considerations and engages with broader economic and policy-related issues, thereby reflecting the complexity and interconnectedness of the global ceramic industry.

In conclusion, the keyword clustering map reveals a rich and diverse research landscape within ceramic tableware design, characterized by aesthetic, cultural, economic, and technological concerns. The high degree of thematic coherence within the clusters indicates a well-established and evolving field where traditions and contemporary challenges coalesce to shape the future directions of ceramic tableware design research.

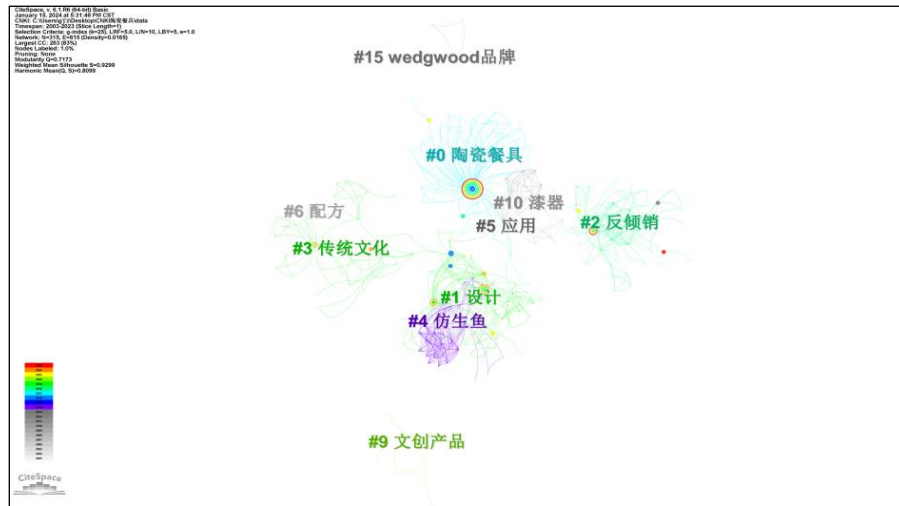


Fig. 5 Keyword clustering map of ceramic tableware design 2003-2023 (Source: Authors, 2023)

4.4.2 Analysis of time evolution of research clusters

Figure 6 illustrates how the ceramic tableware design research clusters have evolved using a graphical timeline created in CiteSpace. The clusters are sorted in descending order based on their size, with the colder curves suggesting proximity to 2003 and the warmer curves indicating proximity to 2023. The literature collection generates several significant clusters based on the interconnection among nodes. The duration of each significant cluster varies, with specific clusters exhibiting greater durations while others have shorter durations. Within these clusters, the most prominent ones are "ceramic tableware," "design," "anti-dumping," and "traditional culture." These four clusters indicate that they formed the primary focus of study in this sector from 2003 to 2023.

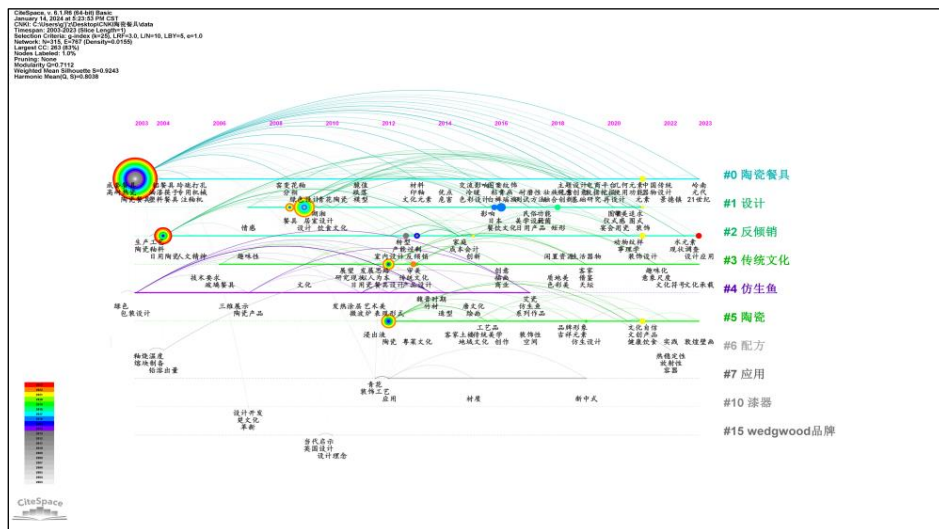


Fig. 6 Timeline diagram of research hotspots of ceramic tableware from 2003 to 2023 (Source: Authors, 2023)

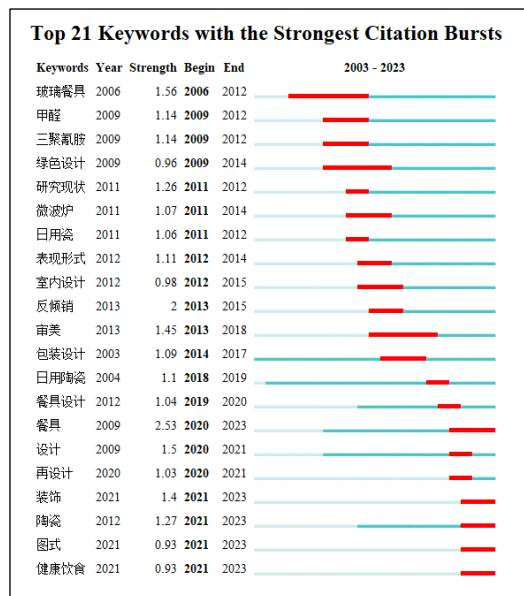


Fig. 7 Top 21 keyword highlights of ceramic tableware design research, 2003-2023 (Source: Authors, 2023)

Regarding terms that appear or are used more frequently in a shorter time, burst detection is a computational technique to discover abrupt changes in events and information (Ding & Yang, 2022). Fig. 7 shows the determined representative keywords from the list of highly cited publications from 2003–2023, based on a visual analysis of CiteSpace-related data. Keywords with high values in the intensity list are typically considered landmarks (Jia et al., 2020), with the highest value being 2.53. The term "tableware" stands out as the most prominent landmark keyword. The subsequent significant term is ceramic tableware (1.56). Tableware and ceramic tableware articles have a significant link, possessing substantial influence and scholarly worth. The 2003-2023 study reveals the top 21 emerging keywords as ceramic tableware, formaldehyde, melamine, green design, current state of research, microwave ovens, daily porcelain, expression, interior design, anti-dumping, aesthetics, packaging design, daily ceramics, tableware design, tableware, design, redesign, decorative, ceramics, patterning, and healthy diet. The research hotspots can be classified into three distinct phases by merging Figures 6 and 7. During the initial phase from 2006 to 2011, scholars primarily researched ceramic tableware's safety and environmental impact. This research primarily centered around ceramic tableware, focusing on selecting environmentally friendly materials for ceramic tableware, such as formaldehyde, melamine, and green design. Design principles were incorporated into ceramic tableware during the second stage, which spanned from 2012 to 2018. Scholars during this period primarily concentrated on the aesthetic examination of ceramic tableware, including aspects such as expressiveness, aesthetics, packaging design, and everyday ceramics. In the third stage, which took place from 2019 to 2023, scholars examined topics related to the design and decorating of ceramic dinnerware, focusing specifically on design innovation.

The analysis reveals an ongoing dialogue between tradition and innovation in ceramic tableware design throughout these phases. The field has progressively shifted from focusing on material safety and environmental sustainability to emphasizing aesthetic appeal and design innovation. This evolution reflects broader trends in design and consumer preferences, underscoring the importance of research in adapting to and shaping these trends. The clustering and timeline analysis provide valuable insights into the field's shifting priorities and emerging themes, offering a roadmap for future research and development in ceramic tableware design.

5.0 Conclusion & Recommendations

Applying CiteSpace's dynamic network analysis on the knowledge graph reveals a significant and rapid increase in interconnected scholarly works between 2003 and 2023. Significant advancements have been achieved in ceramic tableware design research over the past two decades. The knowledge graph provides a systematic representation and evaluation of the development of the ceramic tableware design research domain. Analyzing the prominent members and significant clusters in the Knowledge Graph makes it feasible to investigate the shifts in the literature network within the ceramic tableware design field. This analysis aims to alleviate the cognitive load on researchers when searching for crucial information in the knowledge structure.

Additionally, it aims to facilitate the acquisition of fresh perspectives during the systematic reproduction process in a more straightforward, transparent, and intuitive manner. A prominent cluster is ceramic tableware and design, which serves as a focal point for research and represents a cutting-edge area of study and emerging trends. The study of ceramic tableware encompasses multiple disciplines and has a broad reach. The number of review articles on the topics discussed in the dissertation is growing, leading to a scenario where different research paradigms and methodologies coexist. Through an examination of the keyword structure and timeframe, two distinct primary tendencies were discovered. The initial trend involved a cultural examination of ceramic tableware design and integrating qualitative research from anthropology and sociology. The second approach involves conducting quantitative analysis

and studying the design of ceramic tableware by integrating econometric research tools. The current research on ceramic tableware design is still nascent, with little exploration in terms of research perspective and methodology. In summary, this article effectively enhanced the understanding acquired in the area, and the strategic-level trend analysis of ceramic tableware design is quite favorable. The succeeding research on Chinese ceramic tableware design exhibits significant potential and value with a wide range of research directions.

This research has attained the anticipated outcomes, while certain constraints remain—the papers included in the CNKI core journal database span from 2003 to 2023. Consequently, the literature available for the past two decades only provides a glimpse into recent research findings on ceramic tableware design. As a result, the overall understanding of ceramic tableware design research growth could be improved. Furthermore, this study exclusively relied on CNKI as the database, constraining the findings' range and inclusiveness. The analysis conducted by CiteSpace on the 20-year core paper publication data from the CNKI database in the field of ceramic tableware design in China reveals that research on ceramic tableware design has made some progress. However, due to the recent initiation of research in this area, the design of ceramic tableware remains confined to a limited scope. Therefore, there is still room for improvement and enhancement in both theoretical and applied research related to ceramic tableware design.

This paper contributes significantly to the field of Design Studies, specifically within the niche of Ceramic Tableware Design. It highlights the interdisciplinary nature of ceramic tableware design, encompassing aspects of traditional culture, modern design principles, environmental sustainability, and global trade dynamics.

Moreover, the paper's insights into the shifting research paradigms, from focusing on material safety and environmental considerations to emphasizing aesthetic appeal and design innovation, underscore its relevance to broader disciplines. These include Material Science, Environmental Studies, Anthropology, Sociology, and International Trade Policy, reflecting the multifaceted impact of ceramic tableware design research.

By mapping out the developmental stages, key themes, and future directions of ceramic tableware design research, the paper provides a foundational resource for scholars and practitioners across these fields, encouraging interdisciplinary collaboration and innovation in tackling contemporary challenges within and beyond the realm of design studies.

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Paper Contribution to Related Field of Study

This paper contributes significantly to the field of Design Studies, specifically within the niche of Ceramic Tableware Design. It highlights the interdisciplinary nature of ceramic tableware design, encompassing aspects of traditional culture, modern design principles, environmental sustainability, and global trade dynamics. The research identifies gaps, challenges, and opportunities and provides solid references and new ideas for future ceramic tableware design research.

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