
A Content Analysis of Research Publications of Progress in Materials Science

Heena Bavaskar

Research Scholar,
Dept of Library & Information Science,
Dr. Babasaheb Ambedkar Marathwada University,
Chh. Sambhajnagar, India
Email – heenays18@gmail.com

Manisha Sutar

Librarian & Research Guide, Jalna Education
Society's R.G.Bagdia Arts,S.B.Lakhotia Commerce
R. Bezonji Science College, Jalna, Maharashtra, India
Dr. Babasaheb Ambedkar Marathwada University,
Chh. Sambhajnagar, India
Email- sutarjes@gmail.com

Abstract

The present study analyzes the research publications of Progress in Materials Science during the period 2021–2025 using the content analysis technique. A total of 502 publications were examined to identify patterns of publication productivity, authorship, collaboration, geographical distribution, institutional contribution, communication channels, and research trends. The findings reveal a strong preference for collaborative research, with 487 multi-authored publications and an overall collaboration rate of 0.970. The highest number of publications was recorded in 2023, with 132 publications. Wei, Y. emerged as the most productive author with 7 publications. The institute-wise analysis shows that the Ministry of Education of the People's Republic of China was the leading institutional affiliation with 47 publications. The study demonstrates the dominance of collaborative and internationally distributed research in Progress in Materials Science and provides an overview of the publication characteristics and research patterns during the selected period.

Keywords

Content Analysis; Bibliometric Analysis; Authorship Pattern; Research Collaboration; Materials Science.

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1. Introduction

Content analysis is a systematic research technique used to examine, classify, interpret, and summarise the content of documents and recorded communication. It enables researchers to identify recurring themes, patterns, concepts, and trends within a body of literature and provides a structured approach to understanding published research. Content analysis is particularly useful in bibliometric and literature-based studies because it helps researchers organize large volumes of scholarly information and identify developments within a specific field. The present study focuses on *Progress in Materials Science*, a leading international, peer-reviewed journal in materials science. The journal publishes authoritative review literature covering important advances and emerging developments in materials science and related areas. Analysis of the journal's publications provides an opportunity to identify major research patterns, authorship characteristics, institutional contributions, geographical distribution, and evolving trends in materials science. The study analyzes publications published during the period 2021–2025 and examines various dimensions of scholarly communication, including publication productivity, authorship and collaboration, productive authors, institutional affiliations, communication channels, and country-wise distribution. Such an analysis provides a systematic understanding of the research directions represented in the journal and highlights the development and international character of materials science research.

2. Objectives of the Study

The main objective of the present study is to analyze the content of the journal *Progress in Materials Science* and to quantitatively assess the status and characteristics of its research output during the period 2021–2025. The study focuses on the following objectives:

1. To examine the year-wise growth and distribution of publications.
2. To analyse the geographical distribution of research output.
3. To study the authorship pattern and degree of collaboration among researchers.
4. To determine the extent of international collaboration in the published research.
5. To identify the most productive authors contributing to the journal.

6. To analyse the organisation-wise distribution of publications.
7. To identify the major channels of communication used by researchers in disseminating their research.
8. To identify the high-frequency keywords appearing in the published research and examine the major subject trends.

3. Scope and Limitations of the Study

The scope of the present study is restricted to research publications in Progress in Materials Science from 2021 to 2025. The publications appearing in the journal during this period are analyzed using the content analysis technique. The study is limited to a total of 502 papers published in the journal during the selected five-year period. The analysis focuses on publication growth, geographical distribution, authorship and collaboration patterns, international collaboration, productive authors, organizational affiliation, communication channels, and keyword frequency. Therefore, the findings of the study are restricted to the selected publications and the specified period of 2021–2025.

4. Analysis of Progress in Materials Science

In accordance with the objectives of the present study, publications in Progress in Materials Science from 2021–2025 were analysed using content analysis. The analysis focuses on various aspects of the journal's research output, including year-wise growth in publications, geographical distribution, authorship and collaboration patterns, international collaboration, productive authors, organisational affiliations, communication channels, and keyword frequency. The analysis provides a quantitative assessment of the research trends and publication characteristics of *Progress in Materials Science*. The findings obtained from the analysis are presented in the following sections (Progress in Materials Science, 2021–2025).

4.1 Year-wise Publication Productivity and Collaboration Rate

Publication productivity refers to the number of papers published in a particular year, while collaboration indicates joint research by two or more authors. In this study, the year-wise publication productivity and collaboration rate of *Progress in Materials Science* were analysed for 2021–2025.

Table 4.1: shows the journal's year-wise publication productivity and collaboration rate.

Year	Single Author	Multi-authored Publication	Total No. of Publication	Collaboration Rate
2021	5	77	82	0.939
2022	3	82	85	0.965
2023	4	128	132	0.97
2024	1	84	85	0.988
2025	2	116	118	0.983
Total	15	487	502	0.97

The data indicate a strong trend toward collaborative research during 2021–2025. Out of 502 publications, 487 were multi-authored, with an overall collaboration rate of 0.970. The collaboration rate increased from 0.939 in 2021 to a peak of 0.988 in 2024, then declined slightly to 0.983 in 2025. Overall, multi-authored publications clearly dominated throughout the period.

4.2 AUTHORSHIP AND COLLABORATION TREND

Authorship is an important indicator of scholarly communication, research productivity, and collaboration among researchers. It reflects the extent to which researchers work individually or collectively in producing scholarly publications. Collaboration in research occurs when two or more researchers jointly contribute their intellectual and scholarly efforts to a research project (Dandge & Sonwane, 2023).

Table 4.2: Authorship and Collaboration Trend

Year	Single Author	Number of papers with various authorship									More Than Ten	Total
		2	3	4	5	6	7	8	9	10		
2021	5	11	8	14	15	8	8	4	4	0	5	82
2022	3	17	7	10	12	12	9	7	3	1	4	85
2023	4	5	20	31	9	14	14	12	7	6	10	132
2024	1	5	9	12	17	10	8	8	2	7	6	85

2025	2	9	12	8	18	10	13	14	13	6	13	118
Total	15	47	56	75	71	54	52	45	29	20	38	502

The table shows that multi-authored publications dominated during 2021–2025, with only 15 single-authored publications out of 502. Among multi-authored papers, four-author publications were the highest (75), followed by five-author (71) and three-author publications (56). The highest number of publications in a single year was recorded in 2023 (132). Overall, the data indicates a strong preference for collaborative authorship and team-based research.

4.3 MOST PRODUCTIVE AUTHOR

An author is a person who originates, creates, or contributes to a scholarly work. In bibliometric studies, the most productive author is the researcher who has contributed the most publications during the selected study period. Identifying the most productive authors helps to understand the research productivity and contribution of individual researchers within a particular field.

Table No. 4.3: Most Productive Author

Sr No	Author Name	Total	%
1	Wei, Y.	7	0.72
2	Berto, F.	5	0.52
3	Meyers, M.A.	5	0.52
4	Cui, W.	4	0.41
5	Jiang, S.	4	0.41
6	Kim, H.S.	4	0.41
7	Ramakrishna, S.	4	0.41
8	Singh, G.	4	0.41
9	Vinu, A.	4	0.41
10	Abeykoon, C.	3	0.31
11	Arzt, E.	3	0.31
12	Chen, Z.G.	3	0.31
13	Dong, S.	3	0.31
14	Gao, Q.	3	0.31
15	Kim, J.K.	3	0.31
16	Kumar, P.	3	0.31
17	Liaw, P.K.	3	0.31
18	Nan, C.W.	3	0.31

19	Qiu, J.	3	0.31
20	Ramamurty, U.	3	0.31
21	Razavi, N.	3	0.31
22	Ren, L.	3	0.31
23	Shi, X.L.	3	0.31
24	Sun, X.	3	0.31
25	Voelcker, N.H.	3	0.31
26	Yang, Y.	3	0.31
27	Yang, Z.	3	0.31
28	Yong, W.F.	3	0.31
29	Zhang, J.	3	0.31
30	Zheng, Y.	3	0.31
31	Two Author Publications (2X130)	260	26.83
32	Single Author Publications (1X9)	605	62.44
Total		969	100.00

The table shows that Wei, Y. is the most productive author with 7 publications (0.72%), followed by Berto, F. and Meyers, M.A., with 5 publications (0.52%) each. Several authors, including Cui, W., Jiang, S., Kim, H.S., Ramakrishna, S., Singh, G., and Vinu, A., contributed 4 publications each. A larger group of authors contributed 3 publications each (0.31%). Overall, the data indicates that Wei, Y. has the highest individual research productivity among the listed authors.

4.4 INSTITUTES WISE DISTRIBUTION OF ARTICLES PUBLISHED

An institution is an organized body established for a specific purpose, such as the promotion of science, education, or research. In scholarly communication, institutional affiliation indicates the organisation with which researchers are associated. The institute-wise distribution of publications helps identify the major contributing institutions and understand their research productivity and participation in the selected subject area.

Table No. 4.4: Institutes-wise Distribution of Articles Published

Sr No	Affiliation	Total	%
1	Ministry of Education of the People's Republic of China	47	4.85
2	Chinese Academy of Sciences	42	4.33
3	Tsinghua University	25	2.58

4	Zhejiang University	18	1.86
5	University of Science and Technology Beijing	15	1.55
6	South China University of Technology	15	1.55
7	Shanghai Jiao Tong University	14	1.44
8	Shenzhen University	13	1.34
9	The University of Manchester	12	1.24
10	CNRS Centre National de la Recherche Scientifique	12	1.24
11	Xi'an Jiaotong University	12	1.24
12	Pennsylvania State University	11	1.14
13	National University of Singapore	11	1.14
14	City University of Hong Kong	10	1.03
15	University of Science and Technology of China	10	1.03
16	The Hong Kong Polytechnic University	9	0.93
17	Donghua University	9	0.93
18	Sichuan University	9	0.93
19	Institute of Metal Research Chinese Academy of Sciences	9	0.93
20	University of Chinese Academy of Sciences	9	0.93
21	University of Electronic Science and Technology of China	8	0.83
22	Nanyang Technological University	8	0.83
23	Jilin University	8	0.83
24	Queensland University of Technology	8	0.83
25	Harbin Institute of Technology	8	0.83
26	University of Oxford	8	0.83
27	UNSW Sydney	8	0.83
28	School of Materials Science and Engineering Zhejiang University	8	0.83
29	Sevan Institute Publication (7X13)	91	9.39
30	Sixth Institute Publication (6X14)	84	8.67
31	Five Institute Publication (5X31)	155	16.00
32	Four Institute Publication (4X40)	160	16.51
33	Three Institute Publication (3X34)	102	10.53
34	One Institute Publication (1X1)	1	0.10
Total		969	100.00

The institute-wise distribution shows that Ministry of Education of the People's Republic of China is the leading affiliation with 47 publications (4.85%), followed by the Chinese Academy of Sciences with 42 publications (4.33%) and Tsinghua University with 25 publications (2.58%). Other major contributing institutions include Zhejiang University (18), University of Science and Technology Beijing (15), and South China University of Technology (15). The data also indicates a strong presence of Chinese institutions, while universities and research organizations from countries such as the United Kingdom, United States, Singapore, Australia, and Hong Kong are also represented. Overall, the distribution demonstrates broad institutional participation and significant international involvement in the published research.

4.5 DISTRIBUTION OF LITERATURE IN VARIOUS CHANNELS OF COMMUNICATION

A communication channel refers to the medium through which information is conveyed from a sender to a receiver. In scholarly communication, researchers use different channels to disseminate their research findings, such as journals, conference proceedings, books, and other scholarly sources. The distribution of literature across various communication channels helps to understand the preferred modes of scholarly communication among researchers.

Table 4.5: Distribution of Literature in Various Channels of Communication

Sr No	Channels of Communication	Articles	%
1	Review	468	93.23
2	Article	17	3.39
3	Erratum	9	1.79
4	Retracted	5	1.00
5	Editorial	3	0.60
Total		502	100.00

The data show that Review publications were the dominant channel of scholarly communication, accounting for 468 articles (93.23%) of the 502 total publications. Article publications accounted for 17 (3.39%), followed by Erratum (9; 1.79%), Retracted publications (5; 1.00%), and Editorials (3; 0.60%). Overall, the findings indicate a strong predominance of review literature in the selected research output.

4.6 DISTRIBUTION OF LITERATURE BY COUNTRY

Country-wise distribution of publications helps to identify the geographical contribution and research participation of different countries in the selected subject area. It provides an understanding of the countries that are actively contributing to research and highlights the extent of international participation and collaboration.

Table 4.6: Distribution of Literature by Country

Sr No	Country	Total	%
1	China	264	27.24
2	United States	110	11.35
3	United Kingdom	66	6.81
4	Australia	55	5.68
5	South Korea	49	5.06
6	India	46	4.75
7	Germany	32	3.30
8	Canada	30	3.10
9	Hong Kong	23	2.37
10	Singapore	22	2.27
11	Japan	20	2.06
12	France	19	1.96
13	Iran	19	1.96
14	Italy	18	1.86
15	Taiwan	16	1.65
16	Belgium	12	1.24

17	Malaysia	11	1.14
18	Spain	11	1.14
19	Portugal	10	1.03
20	Netherlands	9	0.93
21	Norway	9	0.93
22	Austria	8	0.83
23	Brazil	8	0.83
24	Ireland	7	0.72
25	Israel	7	0.72
26	Saudi Arabia	7	0.72
27	Poland	6	0.62
28	Sweden	6	0.62
29	United Arab Emirates	6	0.62
30	Pakistan	5	0.52
31	Denmark	4	0.41
32	Finland	4	0.41
33	Russian Federation	4	0.41
34	Switzerland	4	0.41
35	Turkey	4	0.41
36	Three Author Publications (3X7)	21	2.17
37	Two Author Publications (2X4)	8	0.83
38	Single Author Publications (1X9)	9	0.93
Total		969	100.00

The country-wise distribution shows that China is the leading contributor with 264 publications (27.24%), followed by the United States with 110 publications (11.35%) and the United Kingdom with 66 publications (6.81%). Australia, South Korea, and India contributed 55 (5.68%), 49 (5.06%), and 46 (4.75%) publications, respectively. European and Asian countries also show significant participation, indicating broad international involvement in research. Overall, the findings demonstrate that China has a clear dominance in research output, while substantial contributions come from countries across Asia, Europe, North America, and Oceania.

5. Conclusion

The present study provides a quantitative overview of the research publications of *Progress in Materials Science* during 2021–2025. The analysis of 502 publications shows that collaborative research was highly predominant, with 487 multi-authored publications and an overall collaboration rate of 0.970. The highest publication output was recorded in 2023 with 132 publications. The authorship analysis

indicates that four-author publications were the most common, followed by five-author and three-author publications, demonstrating a strong tendency toward team-based research. Wei, Y. was identified as the most productive author with 7 publications. The institutional analysis shows that Chinese institutions made a major contribution, with the Ministry of Education of the People's Republic of China and the Chinese Academy of Sciences occupying the leading positions. The analysis of communication channels indicates that review publications accounted for the overwhelming majority of research output, with 468 publications. Country-wise distribution further demonstrates the international nature of research in the journal, with China being the leading contributor, followed by the United States and the United Kingdom. Overall, the study reveals that *Progress in Materials Science* has a strong international and collaborative research profile. The findings highlight the importance of multi-author research, institutional participation, and international collaboration in the development of materials science research during the period 2021–2025.

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