

A Scientometric Review of Global Research on the Sustainability of Paraffin Oil

¹Arumugam P, ²Sharmila M, ³Jeyanthi R, ⁴Virumandi A, ^{5*}Sivankalai S, ⁶Rega R

¹Librarian, Indian Institute of Astrophysics, Bengaluru, Karnataka 560034

²Technical Assistant, Mother Teresa Women's University, Kodaikanal,

³Librarian, E.M.G. Yadava Women's College, Thiruppalai, Madurai -14.

⁴Service Delivery, Manager, Precision Informatics (M) Pvt Ltd., Chennai

⁵Chief Librarian, Hindustan Institute of Technology & Science (a Deemed to be University), Chennai

⁶Librarian and Information Assistant, Anna Centenary Library, Kotturpuram, Chennai

*Corresponding Author

Abstract

Paraffin oil is a blend of a mineral source of higher alkanes, like oil. The world health organization classifies unrefined or mildly treated mineral oils as Group 3 carcinogens, leading to skin cancer in humans. This study aimed to conduct a detailed scientific analysis of the WoS paraffin oil research papers. We collected data using the web of science with the keywords "paraffin oil" using four databases. A total of 4613 articles were found, of which 89.8% were original articles. We can observe that the author of LIU WM publishes the most articles (39). The highest source is occupied by Energy & Fuels (h index 38, g index 56, m index 1.226, TC: 4502, NP: 183). China was the leading country (982) publications, followed by multi-country publications (90), highest total citations (16583), and at the same time, the Netherlands had produced average article citations (39.53%). Paraffin oil was published in 2019 in 301 papers at its peak. Our study was the first scientific analysis in this field, to our best knowledge, and we believe that paraffin oil research papers require multicentre studies and further research from developing and least-developed nations.

Keywords: Scientometrics, Paraffin oil, Mineral oil, Publication trend analysis, Biblioshiny,

Introduction

Petroleum is commonly used as a fuel or fuel component for jet engines, as a solvent for grease and pesticides, and for household heaters and furnaces. It is mineral oil and a by-product of crude oil, as well as liquid paraffin oil. The most important thing to know about mineral oil is that it is clear, colourless, odourless, and tasteless. A white or colourless, soft, solid wax is called paraffin wax. The blend consists of a mixture of saturated hydrocarbons. While it is colourless, tasteless, and odourless, it is commonly used in skin-softening treatments at salons and spas, like cuticle and pedicure care, on the hands, feet, and fingernails. Pain treatment for aching joints and muscles can also be achieved with this substance. The use of liquid paraffin in new-born care products is permitted under existing criteria, the centre said on Monday. Paraffin wax is widely applied to the hands and feet in cosmetics.

Paraffin has a low melting point, and, as a result, it will melt into a liquid that is heated to a temperature that's not too hot, making it safe to handle. The ointment has a natural composition and assists in softening the skin. Some women may have noticed that they dip them into an opaque white or pink solution while getting their hands or feet washed. Paraffin is commonly utilized in cosmetic

products due to its low cost. It boosts moisture levels right after the treatment is finished. Reducing dead skin cells on the skin and the pores on the skin helps make the skin look healthier and smoother. The traditional use of paraffin has been found to heal numerous ailments, such as arthritis, and improve blood flow. However, if the oil is boiled in kerosene, the risks may be more significant, especially if inhaled or eaten, and if the skin is continually exposed. People can develop hydrocarbon pneumonitis by inhalation of paraffin oil. This oil may cause skin irritation, resulting in contact dermatitis in people who have skin conditions or diseases. Ingestion of paraffin oil might cause digestive discomfort. Unrefined paraffin oil is often considered a carcinogen or cancer-causing substance. As a result, when using paraffin oil, care must be taken. Liquid paraffin oil should be stored in a cold, well-ventilated environment in a tightly closed container. It is highly flammable, so keep it away from sources of heat or ignition and away from direct sunlight. Finally, follow the recommendations on the product's label regarding the handling and storage of liquid paraffin oil.

Scientometrics is the scientific analysis of quantitative aspects of science, technology, and innovation. This chapter examines the multiple methods researchers use to study trends and themes in published scientific literature, such as Dynamic Topic Modeling (R Studio), HistCite, Python, CiteSpace, VOS viewer, and soon. Quantitative features of information are at the forefront of Informetrics research. The study of quantitative aspects of research is known as Scientometrics. World Wide Web indexes that do quantitative web-metrics investigations. The expanded meaning of Webometrics is used here, but there is also the term "cyber metrics."

Research Design

Securing the information was recovered from Web of Science databases. These center assortment data sets are viewed as the most significant and most regularly utilized scientific databases globally. The keywords "paraffin" and "oil" were searched for as topics in the information base of WoS. As a result, 4640 documents were identified as paraffin oil-related research during 1989–2020. Finally, vital records on paraffin oil were chosen for information investigation and representation utilizing two measurements scientometrics applications and programming, including MS Excel and Biblioshiny (R Studio version 4.0.1). A few terms/contractions are utilized for information examination in different tables, such as TP representing total publications, TC for total citations, SCP representing a single country publication, MCP representing a multi-country publication, and IF for an impact factor publication on this topic/area. The reference sway depicts the average citation received by a specific publication. The citation impact (CI) in this examination was calculated by partitioning the total number of citations by the total number of distributions.

Results and Discussion

Table 1 shows the annual total citations per year for articles about paraffin oil. It was observed that the collection of 4613 articles from 1989 to 2020 shows the mean total citation per article (696.39) and the mean total citation per year (55.02). The highest number of articles (301) has been published in the year 2019, with a mean total citation per article (5.36) and a mean total citation per year (2.68). In the years 2013 & 2014, the same number of articles (202) were published with different mean total

citations per article (18.98 & 17.17) and mean total citations per year (2.37 & 2.45). In 1994, 82 articles gave the highest mean per total citation per article (38.07). In 2015, 215 numbers of articles gave the highest mean total citation per year (3.43). In 2020, 300 articles will have the same mean total citation per article and mean total citation per year (1.90). Moreover, annual total citations per year on paraffin oil identified the most productive articles and the least productive articles based on the year-wise publication of articles.

Table 1. Annual Total Citation per Year on paraffin oil

Year	No. of articles	MeanTCperArticles	MeanTCperYear
1989	9	6.11	0.19
1990	14	11.50	0.37
1991	69	22.52	0.75
1992	62	30.05	1.04
1993	71	28.48	1.02
1994	82	38.07	1.41
1995	87	25.34	0.97
1996	101	26.25	1.05
1997	87	27.78	1.16
1998	111	20.71	0.90
1999	112	25.36	1.15
2000	96	23.55	1.12
2001	101	24.66	1.23
2002	106	21.29	1.12
2003	124	23.27	1.29
2004	142	27.26	1.60
2005	127	28.54	1.78
2006	125	28.10	1.87
2007	130	32.01	2.29

2008	155	29.79	2.29
2009	161	25.63	2.14
2010	167	24.66	2.24
2011	204	24.73	2.47
2012	169	25.41	2.82
2013	202	18.98	2.37
2014	202	17.17	2.45
2015	215	20.61	3.43
2016	262	12.27	2.45
2017	240	10.78	2.70
2018	279	8.22	2.74
2019	301	5.36	2.68
2020	300	1.90	1.90
	4613	696.39	55.02

A thematic analysis studies the growth of themes within a scientific discipline, and after that, we will have to explore additional study and forecasting the future development of that field of science. The processes of citation and lexical analysis are both popular strategies for building strategic and domain-specific topic matter maps. The benefits of both approaches may be utilised together to view citation and lexical trends, with the goal of establishing a new way of thinking about scientific research. Lexical analysis of the scientific map uses themed maps to identify important word groupings. The subjects included in these clusters are thought of as themes. The two meanings and the mean values of each cluster have been utilised to create four distinct study topics that are related to these two characteristics (density and centre). The thematical network is formed by a thematic concept with anAuthor's keyword and the internal communications that supports it. One of the most important and relevant Author's keywords linked with a certain topic has been given to each tributary network. We may evaluate the topics by which quadrant they are placed on the thematic map.

- Q1) Top right Quadrant: Motor theme, essential for the study topic, but not developed.
- Q2) The top left quadrant:Niche themes - did not develop anyone subjects.
- Q3) Bottom right Quadrant:Basic Themes - Good topics via research and important to the research structure.
- Q4) BottomLeft quadrant: Emerging and emerging themes and Poor, marginal development.

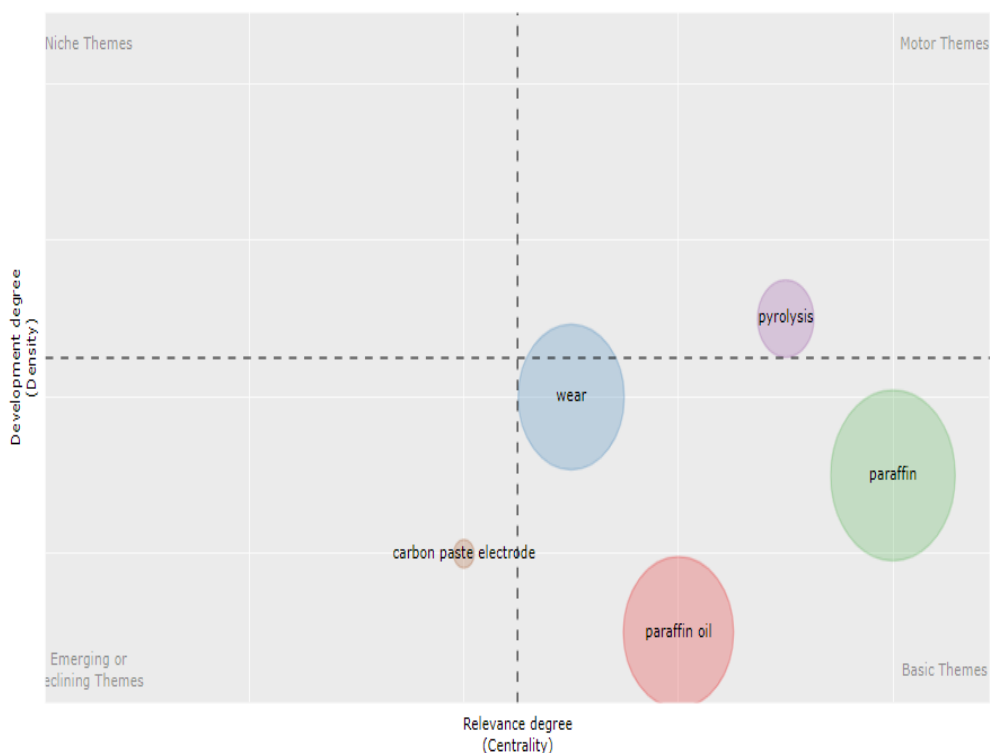


Figure 1. Thematic Map Author keywords on paraffin oil

As we see in Figure 1, the words "paraffin oil and wear" are of great importance for the framework of all research and have always been employed. The term pyrolysis is a key and motor topic linked to the keywords of other authors. The term "carbon paste electrode" is utilised in time statistics along with keywords of the other Author. The terms "paraffin" may be more focused on the current day and are one of the major problems for current and future study.

Table 2. Source Impact on paraffin oil

Source	H index	G index	M index	TC	NP
Energy & Fuels	38	56	1.226	4502	183
Fuel	30	44	0.938	2618	119
Petroleum Science and Technology	17	27	0.68	985	107
Industrial & Engineering Chemistry Research	23	37	0.742	1794	82
Colloids and Surfaces A-Physicochemical and Engineering Aspects	23	43	0.821	2095	74

Journal of Petroleum Science and Engineering	19	37	0.576	1481	56
Wear	29	49	0.935	2509	56
Petroleum Chemistry	8	11	0.276	197	54
Journal of Dispersion Science and Technology	13	22	-	598	50
Journal of Applied Polymer Science	16	22	0.533	611	46
Chemistry and Technology of Fuels and Oils	5	7	0.152	101	44
Tribology International	21	34	0.677	1171	39
Langmuir	23	37	0.793	1402	37
Rsc Advances	15	23	1.667	576	37
Fluid Phase Equilibria	16	27	0.516	764	35
Fuel Processing Technology	17	29	0.548	891	34
Journal of Colloid and Interface Science	19	31	0.704	1200	31
PrzemyslChemiczny	5	5	0.263	56	29
Journal of Analytical and Applied Pyrolysis	18	28	0.667	1341	28
Chemical Engineering Journal	15	26	0.682	734	26

Table 2 displayed the highest top 20 sources for analysing the source impact on Paraffin Oil in the world. From there, we found that the highest source was occupied by Energy & Fuels (h index: 38, g index: 56, m index: 1.226, TC: 4502, NP: 183), followed by Fuel (h index: 30, g index: 44, m index: 0.938, TC: 2618, NP:119). Two numbers of sources collected the same number of (23) h index, such as Industrial & Engineering Chemistry Research (g index: 37, m index: 0.742, TC:1794, NP:82) and Colloids And Surfaces A-Physicochemical And Engineering Aspects (g index: 43, m index: 0.821, TC:2095, NP:74) as well as two numbers of sources published the same articles (56) such as Journal Of Petroleum Science And Engineering (h index: 19, g index: 37, m index: 0.576, TC:1481) and Wear (h index: 29, g index: 49, m index: 0.935, TC:2509). Three of sources had found the very most minor number of h index: (i.e.) below ten, such as Petroleum Chemistry (h index: 8, g index: 11, m index: 0.276, TC: 197, NP:54), Chemistry and Technology of Fuels and Oils (h index: 5, g index: 7, m index: 0.152, TC:101, NP:44) and PrzemyslChemiczny (h index: 5, g index: 5, m index: 0.263, TC:56, NP:29).

Table 3. Most Relevant Authors on paraffin oil

Authors	Articles	Articles Fractionalized %
Liu WM	39	11.50
Xue QJ	38	11.27
Xu J	30	5.00
Grob K	26	8.27
Zhang ZJ	24	5.54
Jesionowski T	22	8.58
Sun DJ	22	4.55
Guo XH	21	3.37
Liu Y	21	3.55
Rastogi RB	21	5.01
Li L	20	3.00
Wang W	20	3.82
Zhang J	20	3.47
Coutinho JAP	19	5.42
Krysztalkiewicz A	19	5.83
Wang J	19	2.87
Li J	18	3.02
Daridon JL	17	4.66
Fogler HS	17	5.02
Akhtar N	16	3.87

The twenty authors involved in the study of paraffin oil are listed in table 3. we can observe that the topmost articles (39) are published by the author of Liu WM (Articles Fractionalized 11.50%), followed by the author of Xue QJ (Articles Fractionalized 11.27%). In the table, 21 articles were published by three authors, such as Guo XH (Articles Fractionalized 3.370%), Liu Y (Articles Fractionalized 3.55%) and Rastogi RB (Articles Fractionalized 5.01%), 20 articles were published by three authors, such as Li L

(Articles Fractionalized 3.00%), Wang W (Articles Fractionalized 3.82%) and Zhang J (Articles Fractionalized 3.47%), and 19 numbers of articles, and 19 numbers of 3.37. The lowest articles (16) were published by Akhtar N (Articles Fractionalized 3.87%) in the overall analysis of this table. Finally, we found that the total number of articles published slowly decreased from the topmost authors to the lowest articles published by each author in the table.

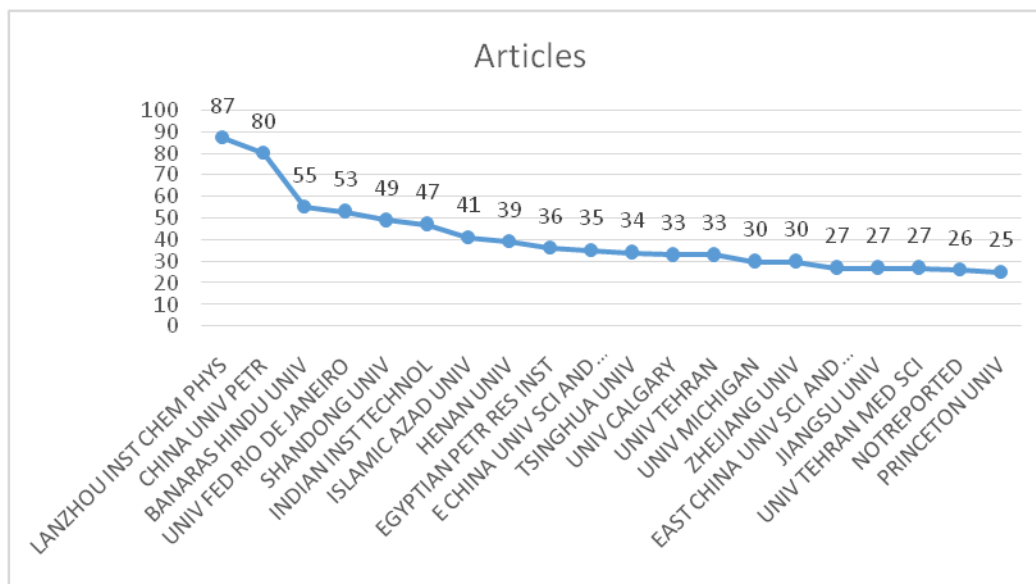


Figure 2. Most Relevant Affiliations on paraffin oil

Table 4. Most Relevant Countries by Corresponding Author on paraffin oil

Country	Articles	Frequency	SCP	MCP	MCP Ratio %
China	982	0.22	892	90	0.09
USA	439	0.10	378	61	0.14
India	262	0.06	246	16	0.06
Russia	186	0.04	170	16	0.09
Japan	177	0.04	147	30	0.17
Germany	164	0.04	122	42	0.26
Iran	154	0.03	143	11	0.07
Brazil	151	0.03	135	16	0.11
France	149	0.03	113	36	0.24
Poland	133	0.03	126	7	0.05

Canada	132	0.03	102	30	0.23
United Kingdom	120	0.03	93	27	0.23
Korea	116	0.03	106	10	0.09
Spain	107	0.02	83	24	0.22
Italy	101	0.02	80	21	0.21
Egypt	91	0.02	77	14	0.15
Turkey	73	0.02	65	8	0.11
Malaysia	52	0.01	31	21	0.40
Australia	48	0.01	31	17	0.35
Hungary	46	0.01	39	7	0.15

SCP -Single country publication, MCP Multi country publication

The analysis of table 4, the top 20 numbers of the most relevant countries, by the corresponding author, contributed to the study on paraffin oil. China has registered in the most productive place in the table (Articles: 982, Frequency: 0.22, SCP: 892, MCP: 90, MCP Ratio: 0.09%), followed by the USA (Articles: 439, Frequency: 0.10, SCP: 378, MCP: 61, MCP Ratio: 0.14%). India depicted the third position in the table (Articles: 262, Frequency: 0.06, SCP: 246, MCP: 16, MCP Ratio: 0.06%). Seven countries showed the same frequency (0.03) with a different number of articles published, such as Iran (154), Brazil (151), France (149), Poland (133), Canada (132), the United Kingdom (120) and Korea (116). Malaysia and Australia displayed the same number of SCP (31). Furthermore, India, Russia and Brazil displayed the same number of MCP (16). Among these countries, Poland displayed the lowest MCP Ratio (0.05%) in the table.

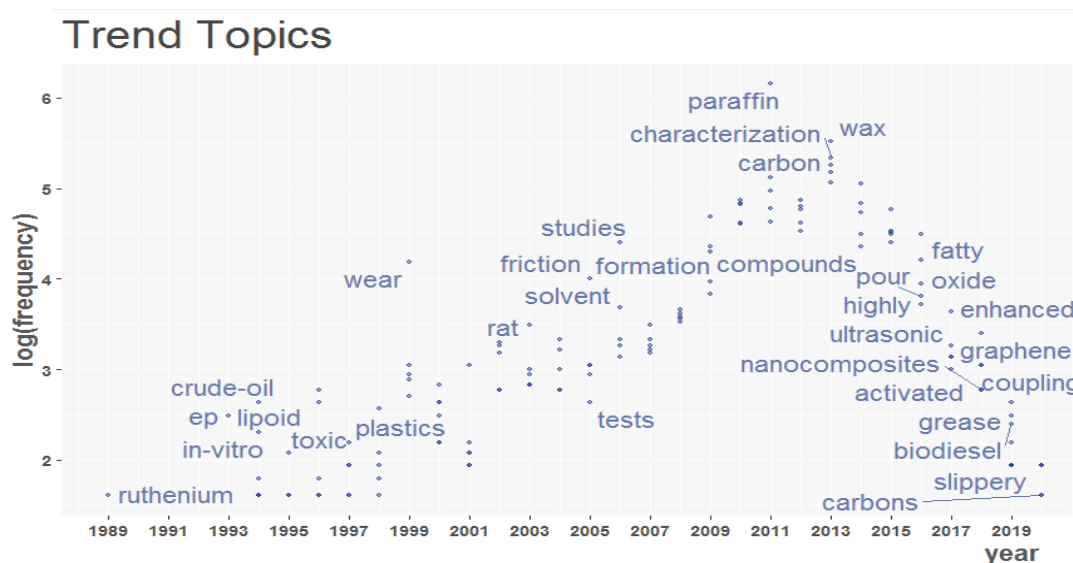


Figure 3.Titles based Trend Topics on paraffin oil.

A hot topic is a subject that gains popularity quickly in one or more paraffin oils. Topic trends are also part of this research, where figure 3 shows an overview of the development of the topic from time to time with the division per year. So, topics have been used for a long time and what topics have been used recently. The emergence of the topic is also adjusted to the frequency of the word's appearance in research on the theme of paraffin oil research. The higher the word is used, and the more to the right, the more recent it is used. The development of the topic has experienced a significant increase since 1993. Based on the description of the data above, the topic has been used since 1993, especially those related to paraffin oil research. Furthermore, in 2013, the topic of nanocomposites, compounds, carbon, and paraffin began to emerge. Even though it has been a reputation for a long time, the quantity of one topic that has emerged under 2020 is still small. Topics related to the PLS (Product Listing Scheme) scheme in the paraffin oil industry began to be worked out in 2017-2019. Meanwhile, many topics related to slippery, biodiesel and graphene, coupling began to be carried out in 2017 to 2019.

Table 6.MostCitedCountrieson paraffin oil

Country	Total Citations	Average Article Citations %
China	16583	16.89
USA	14339	32.66
India	3833	14.63
Germany	3824	23.32
France	3381	22.69

Japan	3247	18.34
Spain	3132	29.27
Canada	2839	21.51
Iran	2739	17.79
United Kingdom	2648	22.07
Brazil	2254	14.93
Italy	2102	20.81
Korea	2078	17.91
Netherlands	1700	39.53
Russia	1395	7.50
Turkey	1345	18.42
Switzerland	1336	35.16
Australia	1176	24.50
Malaysia	1131	21.75
Hungary	959	20.85

The most cited countries for paraffin oil research papers are total citations and average article citations. In table 6, the top twenty countries produced productive results for the study of this field. The first place was accumulated by China, which had produced total citations (16583) and, at the same time, the Netherlands had produced average article citations (39.53%), followed by the USA, which had produced total citations (14339) and, at the same time, Switzerland had produced average article citations (35.16%). Finally, the last two places accumulated by Malaysia and Hungary had produced total citations of (1131 and 959), and India and Russia had produced average article citations (14.63% and 7.50%) respectively had produced average article citations (14.63%) and at the same time.

We can visualise text data in the form of a word cloud, which is also known as a text cloud or tag cloud. To help us examine the texts, the text mining package (TM) and the word cloud generator package (word cloud) are available in R. Topics connected to chemicals are many. It was very uncommon for researchers to combine keywords with other elements. The term "health" is the most often used word in the abstract, while the word "paraffin" is the most frequently used word in the title. Concepts and titles in the abstract are more general and thus less likely to be topical. Figure 4 depicts the word cloud constructed from the keywords of the authors. Highly studied words in literature tend to be

larger. Paraffin and crude oil appear in literature more often than any other kind of oil. These are the most prominent terms utilised; therefore, these are the ones to use. An organic compound has been widely used in China, the United States, and India. Science is the focus of the literature. Because that is why much study is done on the social elements of society, considerable effort is put into researching them. It is like the other findings in that study, which connect covering with paraffin oil, wearing paraffin wax, viscosity, pyrolysis, etc. According to research, stability, additives, emulsion, nanoparticles, and hydrocracking are relevant. Some investigations have shown that mineral oil, employed as a biodegradation agent, is also used in the text. It seems like all these authors' keywords are connected and talk about all the world's issues. Use these stories to help prevent globalised oil from being squandered in the future.

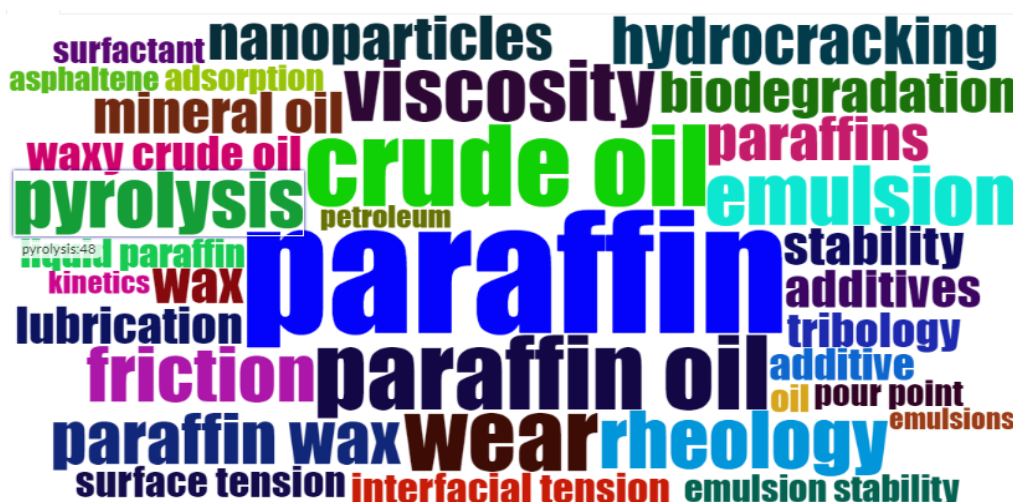


Figure 4. Wordcloud most frequent author keyword on paraffin oil

The most productive papers focus on table 8 for analyzing the most global cited documents on paraffin oil through Total Citations, TC per Year and Normalized TC. The paper by Otto Cm, 1994, Circulation, identified the first place among all the papers presented in the table (Total Citations: 894, TC per Year: 31.93 and Normalized TC: 23.48%). Two papers obtained the exact total citations (400), such as Battez Ah, 2008, Wear and Corma A, 2007, J Catal, and at the same time, second place in TC per Year (31.63), Normalized TC of (14.74) obtained by Allahverdian S, 2014, Circulation. From these tables, the least number of total citations (216) obtained by Chew TI, 2008, BioresourceTechnol, the least number of TC per year (7.60) obtained by ThanooBc, 1992, J Pharm Pharmacol, and the least number of Normalized TC (6.78%) obtained by Kabir M, 2007, Am J ClinNutr.

Table 8. Most Global Cited Documents on paraffin oil

Author	Years	Journals	Total Citations	TC per Year	Normalized TC %
Otto Cm	1994	Circulation	894	31.93	23.48
Battez Ah	2008	Wear	400	28.57	13.43

Corma A	2007	J Catal	400	26.67	12.50
Fernandez P	2004	Colloid Surface A	310	17.22	11.37
Martinez-Palou R	2011	J Petrol SciEng	307	27.91	12.41
Kida S	1993	Neuropath ApplNeuro	289	9.97	10.15
Singh P	2000	Aiche J	264	12.00	11.21
Allahverdian S	2014	Circulation	253	31.63	14.74
Lima Dg	2004	J Anal ApplPyrol	247	13.72	9.06
Gamota Dr	1991	J Rheol	246	7.94	10.92
PetrovicZs	2005	Biomacromolecules	237	13.94	8.30
Huang Hd	2006	Wear	231	14.44	8.22
Zhang Ch	2006	J Catal	230	14.38	8.18
ThanooBc	1992	J Pharm Pharmacol	228	7.60	7.59
Weitkamp J	2012	Chemcatchem	223	22.30	8.77
Youssef N	2009	AdvApplMicrobiol	223	17.15	8.70
Zecevic J	2015	Nature	221	31.57	10.72
MansooriGa	1997	J Petrol SciEng	219	8.76	7.88
Kabir M	2007	Am J ClinNutr	217	14.47	6.78
Chew TI	2008	BioresourceTechnol	216	15.43	7.25

A dendrogram represents the correlation data in graphical form. The compounds are arranged at the bottom of the dendrogram and are known as leaf nodes. Compound clusters are composed of a joining point called the node of compounds or existing compound clusters. A hierarchical cluster analysis could be performed on this set of dissimilarities. By analysing statistical data, the method being developed builds a hierarchy of clusters. It tries to put nearby data into clusters. This is specifically what one would expect: keywords and keywords located near each other on the keyword map tend to be aggregated together. Also, it should be noted that the dendrogram offers additional information. Other factors, such as the subjects' size, show that friction appears to be a bit further away from wear than from additives. This task is to verify whether the output of clustering is correct. Consider, for instance, that we could use a colour bar to see if the keywords "plus" are indeed assigned to words. In this example, the clustering has successfully grouped keywords plus words. Despite a few logical

inconsistencies, everything matches up perfectly. It may be helpful to consider biomass as another hydrocarbon compound rather than a vegetable oil compound, as suggested by the clustering.

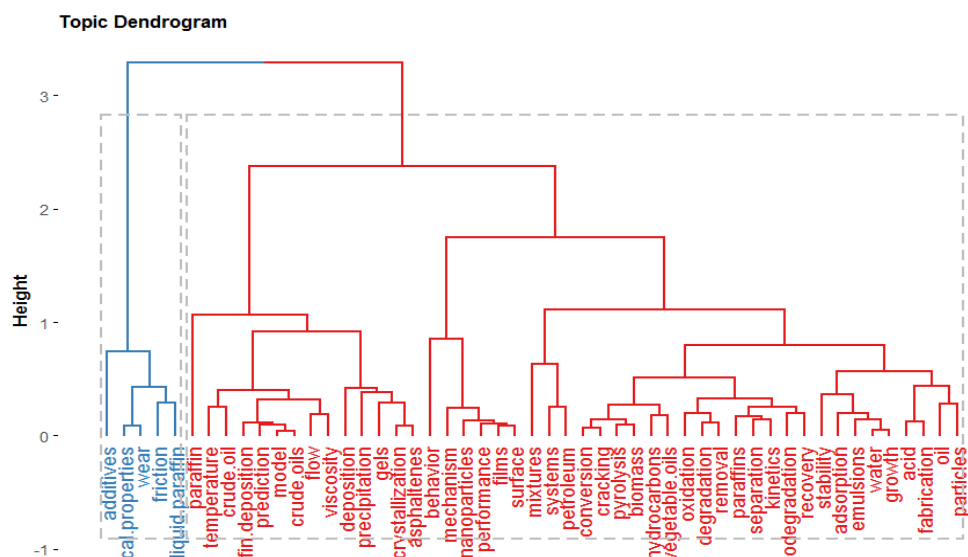


Figure 5. Factorial Analysis Multiple correspondence analysis with keyword plus

Conclusion

The current study evaluated the results published between 1989-2020 in worldwide paraffin oil research. The publications have been seen to increase gradually—the survey identified journal papers as the research publications of paraffin oil researchers as their preferred form. In paraffin oil research, China, the United States, and India are the most prolific respective authors and quoted nations. The article publication recognises two groups of affiliations with near equal values. By considering the characteristics of Scientometrics, the most favoured publishing sources may be discovered in the count of publications, quotes, and h-indexes, "sources", "associations," "bibliometric," and "cluster analyses". The findings of this study have indicated that further research should, in theory, be done by integrating various techniques to illustrate the gulf in science design skills or methodologies, which are essential in politics and planning. Scientology counselors should have soft training and different tools used to create and evaluate the map.

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