

Thin Film Funding and Research Output of India and China: A Comparative Study

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Abstract - The present study analyzes the funded and non-funded Indian and Chinese thin-film research output published from 2001 to 2019. The study reveals the different aspects of thin-film literature in top most five funding agencies in countries like India and China. China contributed the highest research publications with 41,809 records by the support of 30,523 funding agencies papers with 50, 8318 citation contributions. The countries funded papers were 73.01% and Un-Funded Papers were only 32.51%. India has contributed a total number of research publications in the field of a thin film with 16,308 by the support of 8,724 funding agencies papers with 1, 03,577 citation contributions, India has total funded papers of only 45.36% and Un-Funded total Papers of 54.64, India has 857 journals published and 646 journals supported by the funding agency., China has 1138 journals published supported by 995 funding agencies.

Keywords: Thin Film, China, India, Scientometric, Web of Science (WoS), NSFC, Funding Agency, Document type, and Research Productivity.

I. INTRODUCTION

As Amartya Sen said in one of the lectures, “In more unequal societies, too many people lack the basic tools to get ahead—decent nutrition, healthcare, education, skills, and finance. This can create a vicious cycle, whereby economic insecurity causes people to invest too little in skills and education. As the Bank of England’s Andrew Haldane put it, being poor taxes the mind every bit as much as the wallet” (Christine, 2014). Thus funding agencies act as a backbone for all the research and development activities, which also help in discovering many things that assist human being in completing their difficult tasks as much as easier.

In economics, “BRICS countries” or the “Big Five” is an umbrella acronym that refers to the countries of Brazil, Russia, India, China, and South Africa that are all considered to be in a similar stage of development recently advanced economic Emerging markets, particularly the BRICS countries, now account for a quarter of global economic activity. The first person to use the BRICS acronym in 2001 is economist Jim O’Neill of Goldman Sachs. (O’Neill, 2001).

Thin films are thin material layers ranging from fractions of a nanometer to several micrometers in thickness, Electronic

semiconductor devices, and optical coatings are the main applications benefiting from thin film construction, Thin films in household mirror typically have a thin metal coating on the back sheet of glass to form a reflective interface, Thin film technology is widely used in photo electrochemical and dye-sensitized solar cells. (O’Regan & Gratzel, 1991).

This study divulges research publications published in the field of thin-film by utilizing funds from various funding agencies, by applying various Scientometric indicators such as authorship pattern, year-wise growth rate, Channels of communication which published research papers published on Thin Film by BRICS countries.

Research funding generally includes any funding for scientific research in the fields of social science, technology, and the natural sciences, a term that refers to funding received through competitive development, in which research projects are potentially evaluated and only the most promising receiving funds. Most research funding comes from two major sources, corporations (through research and development departments) and government (mainly through specific universities and government agencies, commonly referred to as research boards). The National Natural Science Foundation of China (NSFC) is an organization directly affiliated with the State Council of China to administer the National Natural Science Fund. The NSFC was founded in February 1986 by the theoretical chemist Tang Ayoking with the approval of the Council of State. It is an organization funded by the National Fund for Natural Sciences, which aims to promote and fund original research and applied research in China.

Department of Science and Technology is a division of the Ministry of Science and Technology, India. It was established in May 1971 to promote the new fields of science and technology and to play the role of the Nodal Division to organize, organize and promote scientific and technical activities in the country. It funds various approved scientific projects in India. It supports various researchers in India to attend conferences abroad and perform practical tasks.

II. RESEARCH OUTPUT AND ECONOMIC IMPACT CHINA AND INDIA COUNTRIES

China: In 1949, the Chinese government adopted the model of science and technology in the Soviet Union, with the aim of building a comprehensive and specialized university-wide national discovery system and a generalized network of public research institutions under the government of central agency (Nelson 1993). China's new comparative advantage in the production of scientific and engineering knowledge will be a major driver of the division of labor and trade between countries and the direction of worldwide research and technological and economic development. Much has been invested in science and engineering, from being bit players to contribute to global scientific activities (Arbritis & McCook, 2017). China has enjoyed rapid and sustained economic growth since its economic reform began in 1978. Inflation net, the annual growth rate between 1978 and 2010, was 7.7% (Heston, Summers and Atten, 1912).

India: The national importance of science and technology in India for national and economic prosperity has been widely recognized since the independence of the country, the first step was to develop infrastructure and systems to promote research, new science, and technology ministries to monitor these developments, numerous research institutes and the Scientific and Industrial Research Council. The research will be carried out by a series of organizations set up specifically to work on the needs of different industries and will be defined by the strategic focus of the Planning Commission of India on development through industrialization (Rizvi and Gorur). Despite the fact that the new strategic platform expresses a desire to move away from the nation of innovation as a high-tech scientific activity, p. Emphasizing the absurdity of global indicators such as patents, publications and references as the site of India's innovation policy, the 2013 Science and Science Innovation Policy still reflects some of the traditional elements of the old model. "India's research productivity is equal to that of most G8 countries in seven to eight years." (Economics Time, 2013).

III. METHODOLOGY

The data for the present study has been downloaded from the Web of Science (WoS) database in the field of Thin Film Research of India and China countries from 2001 to 2019. The collected data has been analyzed by applying the normal count procedure. The same data has been scrutinized by following various aspects of the Scientometrics for which researchers used MS Excel Spreadsheets to represent data in the tabular form, appropriate graphs used to represent collected data in an effective manner.

IV. SCOPE AND LIMITATION OF THE STUDY

The present study deals with the Thin Film research output of Indian and China countries published from 2001 to 2019, which is available in Web of Science bibliographical Database. Thus the study is restricted to 19 years of data.

V. OBJECTIVES OF THE STUDY

1. To know about the funding agencies Supported to India and China country research and development activities especially in the field of Thin Film research;
2. Document type-wise Distribution Funding agencies
3. To Analyze the top Five Subject Fields Funding agencies supported in India and China to carry out research in Thin Film;
4. To find out the top Five Journal of communication published in Thin Film research output

VI. REVIEW OF LITERATURE

Balasubramani, (2015) analyzed the impact of competitive financing on the outcome of research by BRIC Countries, The findings revealed that China had published the maximum number of funds supported the SCI documents, contributing to 652,709 records. In the three main funding agencies, CNPQ assigns the maximum no. of publications in Brazil with 35,863 articles that contribute to (38.87%) of the SCI documents financed with funds. The general sources of financing are diversified in India and Brazil, which means that there is not much difference between the contributions of financing agencies.

Kumbar & Biradar (2015). This paper study on filed Forensic Science during the period of 2001 to 2015, it shows the ten main funding agencies that financially assist in research activities in the field of forensic sciences and Economic and Social Research Council, ESRC 221, is becoming the world's leading funding agency in the field of Forensic Sciences, followed by the second stage National Institute of Alcohol Abuse and Alcoholism funded for 201 research activities, It can be concluded from the previous analysis that ESRC highly supports research activities in the field of Forensic Sciences.

Hydarali (2016). This paper study the Graphite Research in India during the period from 1989 to 2014 total 25 years, this author identified the top-ranked 10 founding agencies and first-ranked in "Council of Scientific and Industrial Research (CSIR) New Delhi" 317 papers published with 9.81% and the "Council of Scientific and Industrial Research" New Delhi provided more funding for graphite research and publications in the section. The Atomic Energy Board of Research in Nuclear Science with 5 papers 0.15%.

Kumar (2018). This Paper research productivity of ARIES in Nainital during the period from 2001 to 2015 total in the fifteen years research, data download from *Web of Science* (WoS), and identified the top ten ranked funding research and funding agencies and countries, the USA is the top of the ranked contribution funding agencies 102 research publication with 17.77% during the research 2001 to 2015 and total 168 papers published through the project funding agency. Project funded agencies research is very high in

ARIES 29.27% out of the Top Ten Project Funding Agencies eight are from Western Developing Countries.

Indrani & Murugan (2017). This article research on Fossil Fuels output study during the 28 years from 1989 to 2016, Data was downloaded from the (WoS) *Web of Science* this study purpose of research actives, and identify the top 10 funding agency authors, institutions, research areas and funding agency worldwide. Total No. of 10416 funding agencies have thought sponsored and produced 18131 scholarly of publications, that was found the 10416 funding agencies, the maximum No. of 483 2,664% research articles was publications, National Science Foundation of China was 205 records with 1.13% we noticed that china his highest funding agency supported.

VII. ANALYSIS AND DISCUSSION

A. Year-Wise Distribution of Funded and Unfunded Publications China

From the below table no. 1 we see that China has 41809 published papers and 30523 unfunded papers from the past 19 years. With no. Publication in the year 2004, slowly raising from the year 2008 to 2019, with a maximum of 96 % during the period 2017 to 2019.

TABLE I THE NUMBER AND PERCENTAGE OF FUNDED AND UNFUNDED PUBLICATIONS OF CHINA

Year	No. of Publication	Funded Paper	%	Unfunded Paper	%
2001	526	1	0.19	525	99.81
2002	582	1	0.17	581	99.83
2003	753	2	0.27	751	99.73
2004	985	0	0.00	985	100.00
2005	1267	2	0.16	1265	99.84
2006	1486	8	0.54	1478	99.46
2007	1681	15	0.89	1673	99.52
2008	1917	523	27.28	1394	72.72
2009	2052	1586	77.29	466	22.71
2010	1878	1579	84.08	299	15.92
2011	2429	2090	86.04	339	13.96
2012	2488	2241	90.07	247	9.93
2013	2808	2558	91.10	250	8.90
2014	3157	2963	93.85	194	6.15
2015	3592	3367	93.74	225	6.26
2016	3737	3505	93.79	232	6.21
2017	6472	6222	96.14	250	3.86
2018	3260	3150	96.63	110	3.37
2019	739	710	96.08	22	2.98
	41809	30523		11286	

From the above 19 years of data, we see that only 73% of Thin Film paper publication was supported by funding agency, and 27% were un funded. Furthermore, the number of publications in 2017 doubled the number of publications in 2016 as in Figure 1.



Fig.1 Percentage of funded and unfunded publications of China

B. Year-Wise Distribution of Funded and Unfunded Publications India

India with 16308 publications has 8724 funded papers and 7584 unfunded papers from the past 19 years of data taken for analysis. With no publications, in the years 2002 and 2003, the funded papers slowly increased during the year 2008 to 2019, providing a maximum of 71% publications during the year 2017 to 2019.

TABLE II THE NUMBER AND PERCENTAGE OF FUNDED AND UNFUNDED PUBLICATIONS OF INDIA

Year	No. of Publication	Funded Paper	%	Unfunded Paper	%
2001	185	1	0.54	184	99.46
2002	272	0	0.00	272	100.00
2003	308	0	0.00	308	100.00
2004	342	1	0.29	341	99.71
2005	378	3	0.79	375	99.21
2006	497	2	0.40	495	99.60
2007	581	2	0.34	579	99.66
2008	678	121	17.85	557	82.15
2009	747	354	47.39	393	52.61
2010	776	423	54.51	353	45.49
2011	849	538	63.37	311	36.63
2012	909	604	66.45	305	33.55
2013	1088	683	62.78	405	37.22
2014	1362	931	68.36	431	31.64
2015	1442	932	64.63	510	35.37
2016	1567	1042	66.50	525	33.50
2017	1436	1028	71.59	408	28.41
2018	1576	1120	71.07	456	28.93
2019	1315	939	71.41	376	28.59
	16308	8724		7584	

From the results of the above table, showing for data taken from 19 years, only 53.5% of Thin Film paper publication

was supported by funding agency and 46.5% were unfunded. Furthermore, the number of publications varied between 2016 and 2017 as shown in table II.

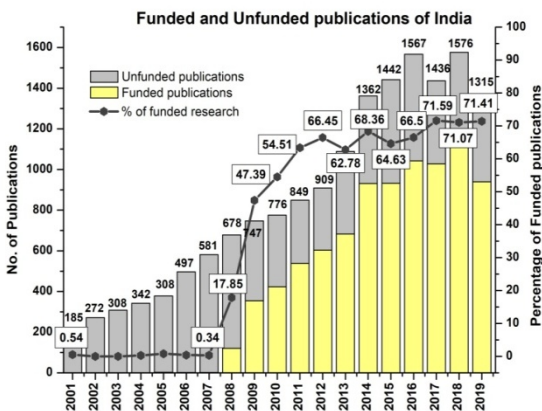


Fig.2 Percentage of funded and unfunded publications of India

C. Funding agencies supported Research in Thin Film published by Indian and China Country

Table III replicates the funding agencies supported for research publications of India and China during 2001-2019.

After scrutinizing the available data, researchers found that economically strong countries like China, dominating in the field of research and development activities, published 41809 research papers in which 73.01% research publications published with funding agencies support providing 508318 citations and 16.65 ACPP.

India stands in the second position with 16308 research papers in which 8724 research papers published with the help of funding agencies with 103577 citations and 11.87 ACPP.

TABLE III THIN FILM FUNDING SUPPORTED PAPERS IN INDIAN AND CHINA COUNTRY

Country	Funded Papers	%	Total Citation	%	ACPP	Un-funded Papers	%	Total Citation	%	ACPP	Total Papers	Total Citations
India	8724	53.50	103577	45.36	11.87	7584	46.50	124759	54.64	16.45	16308	228336
China	30523	73.01	508318	67.49	16.65	11286	26.99	244865	32.51	21.70	41809	753183

D. Indian top Five Funding Agencies

TABLE IV TOP FIVE FUNDING AGENCIES IN INDIA

Sl. No.	Funding Agencies	Papers	%	Citation	%	H-Index
1	Department of Science Technology India	1962	22.5	29898	28.9	63
2	University Grants Commission India	1615	18.5	23459	22.7	58
3	Council of Scientific Industrial Research CSIR India	1399	16	20971	20.3	55
4	Department of Atomic Energy	285	3.27	3678	3.55	29
5	Board of Research in Nuclear Sciences BRNS	276	3.16	3637	3.51	31

India has sought financial support and published 16308 papers out of which 8724 research papers were published with the help of funding agencies, in the field of Thin-film during 2001-2019.

Amongst 8724, the above table shows the support provided by various funding agencies, out of which, Department of Science Technology India has helped with the financial backing to publish papers 1962 (22.29%), 29898 citations (28.87%) with 63 h-index research during the period of

study, followed by University Grants Commission India with 1615 (18.51%) research papers, 23459 citations (22.65%) with 58 h-index stands in the second position, whereas Council of Scientific Industrial Research CSIR India stands in the third position by supporting financial assistance to 1399 (16.04%) of research publication 20971 citations with 29 h-index the remaining papers published lowest output numbers below 4 percent of output.

E. Top Five Funding Agencies for China

TABLE V TOP FIVE FUNDING AGENCIES IN CHINA

Sl. No.	Funding Agencies	Papers	%	Citation	%	H-Index
1	National Natural Science Foundation of China	21335	69.9	184022	36.2	129
2	National Basic Research Program of China	4320	14.2	107316	21.1	132
3	Fundamental Research Funds for the Central Universities	2578	8.45	95913	18.9	127
4	Chinese Academy of Sciences	1490	4.88	46806	9.21	97
5	China Postdoctoral Science Foundation	1183	3.88	18675	3.67	60

Table V reveals that top five funding agencies in China, contributed 41809 research papers and development activities in the field of Thin Film. Among 30523 (73.01%) funding agencies research papers, National Natural Science Foundation of China assisted its financial support to publish 21335 research papers with 69.90%, 184022 (36.20%) citation with 129 h-index followed by National Basic Research Program of China supporting 4320 (14.15%)

and 107316 citation research papers standing second. Fundamental Research Funds for the Central Universities funding agencies paper published 2578 (8.45%), 95913 (18.87%) with 127 h-Index. Among the top five funding agencies, almost 70% of agencies are active at the national level, this table also reveals that the above agencies helped and supported more than 1000 research publications in the field of Thin Film research.

F. Document Type-wise Distribution Funding Agencies Papers Indian and China Country

TABLE VI DOCUMENT TYPE-WISE DISTRIBUTION INDIAN AND CHINA COUNTRY

Document Type	INDIA								TP
	Funded				Un-Funded				
	P	%	C	ACPP	P	%	C	ACPP	
Article	8424	96.56	97301	11.55	6646	87.63	108149	16.27	15070
Proceedings Paper	152	1.74	631	4.15	784	10.34	8930	11.39	936
Article Review	148	1.70	5645	38.14	128	1.69	7529	58.82	276
Correction	0	0.00	0	0.00	12	0.16	11	0.92	12
Editorial Material	0	0.00	0	0.00	6	0.08	30	5.00	6
Book Chapter	0	0.00	0	0.00	1	0.01	54	54.00	1
Letter	0	0.00	0	0.00	5	0.07	56	11.20	5
Meeting Abstract	0	0.00	0	0.00	2	0.03	0	0.00	2
Total	8724		103577		7584		124759		16308
Document Type	CHINA								TP
	Funded				Un-Funded				
	P	%	C	ACPP	P	%	C	ACPP	
Article	29236	95.78	459777	15.73	9580	84.88	212310	22.16	38816
Proceedings Paper	356	1.17	1903	5.35	1479	13.10	14417	9.75	1835
Article Review	923	3.02	46409	50.28	164	1.45	17225	105.03	1087
Correction	0	0.00	0	0.00	11	0.10	4	0.36	11
Editorial Material	2	0.01	6	3.00	3	0.03	14	4.67	5
Book Chapter	1	0.00	213	213.00	16	0.14	274	17.13	17
Letter	5	0.02	10	2.00	27	0.24	621	23.00	32
Meeting Abstract	0	0.00	0	0.00	6	0.05	0	0.00	6
Total	30523		508318		11286		244865		41809

Table VI shows the details of thin-film research from 2001 to 2019 for both the countries with India documenting 8724 papers and China documenting 30523 papers, published from funding agencies, there are eight distinct document types. Indian has highest frequent ones being *Article* 8424(96.56%), 97301 citations with Average citation per paper 11.55, *Proceedings Paper* 152 (1.74%) 631 citations with ACPP 4.15, *Article Review* 148 citation 5645 with 38.14 ACPP papers published form funding agency, the remaining document type papers published 0 percentage lowest output. Indian un-funded paper document type published *Article* 6646 (87.63%) 108149 citations with 16.27 ACPP, *Proceedings Paper* 784 (10.34%) 8930 citation with 11.39 ACPP, *Article Review* 128 (1.69%) 7529 citation with 58.82 ACPP, the remaining document type papers published 0 percentage lowest output.

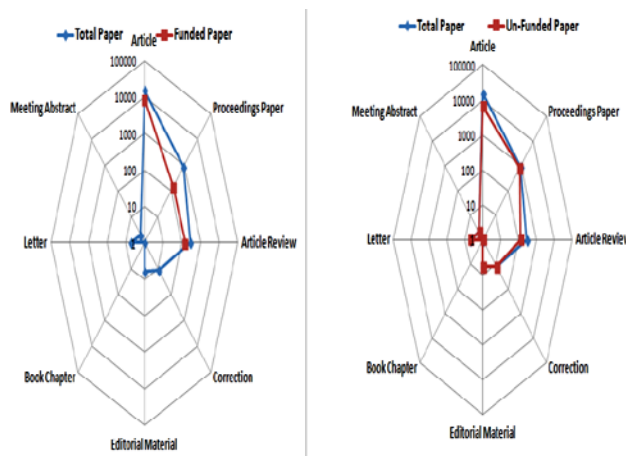


Fig.3 Document Type India Funded and Un-Funded Paper

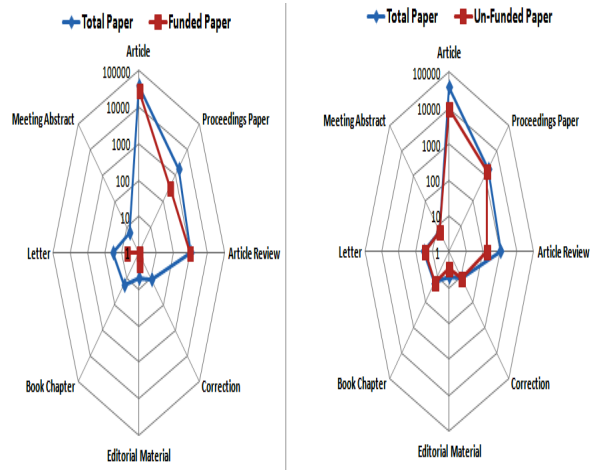


Fig.4 Document Type China Funded and Un-Funded Paper

China country the highest frequent *Article* 29236 (95.78%), 459777 citations with ACPP 15.73, *Proceedings Paper* 356(1.17%) 1903 citation with ACPP 5.35, *Article Review* 923 (3.02%) citation 46409 with 50.28 ACPP papers published form funding agency the remaining document type papers published 0 percentage lowest output.

China country un-funded paper document type published *Article* 9580 (84.88%) 212310 citations with 105.03 ACPP, the remaining document type papers published 0 percentage lowest output.

G. India country Subject Fields Funding Agencies supported Papers Research

TABLE VII RESEARCH PUBLICATIONS OF INDIA BY SUBJECT FIELDS

Subject Fields	Funded				Un-Funded			
	P	%	C	ACPP	P	%	C	ACPP
Physics	2658	30.47	27854	10.48	3312	43.67	53188	16.06
Materials Science	2190	25.10	22991	10.50	963	12.70	14339	14.89
Chemistry	733	8.40	10469	14.28	688	9.07	11150	16.21
Science and Technology	195	2.24	7573	38.84	187	2.47	3826	20.46
Polymer Science	102	1.17	871	8.54	73	0.96	986	13.51
Others Subject Fields	2846	32.62	33819	11.88	2361	31.13	41270	17.48
Total	8724		103577		7584		124759	

Table VII shows the Indian country funding agencies supported total 151 research subject field's on thin film during the 2001 to 2019 total published 16308 paper and 228336 citations, and funding agencies supported papers published 8724 and first ranked most paper published fields *Physics* 2658 (30.47%), 27854 citations with 10.48 ACPP, *Materials Science* 2190 (25.10%), 22991 citations with

10.50 ACPP second-ranked, *Chemistry* 733 (8.40%), 10469 citations with ACPP 14.28 third-ranked, *Science and Technology* 195 (2.24%), 7573 citations with 38.84 ACPP, *Polymer Science* 102(1.17%), 871 citations with 11.88 ACPP paper published, the remaining others subject fields papers published 2846 with 32.62 percentage output. Un-funded total 153 subjects paper published the highest

subject filed of *Physics* 3312 (43.67%), 53188 Citation with 16.06 Average citation per paper, *Materials Science* 963 (12.70%) paper, 14339 citations with 14.89 ACPP, *Chemistry* 688 (9.07%) 11150 Citation 16.21 ACPP,

Science and Technology 187 (2.47%) and *Polymer Science* 73 (0.96%), the remaining others subject fields paper published 2361 (31.13%) 41270, ACPP 17.48 total output.

H. Research Publications for Subject Fields supported by Funding Agencies in China

TABLE VIII RESEARCH PUBLICATIONS BY CHINA BY SUBJECT FIELDS

Subject Fields	Funded				Un-Funded			
	P	%	C	ACPP	P	%	C	ACPP
Physics	7329	24.01	75313	10.28	4370	38.72	61387	14.05
Science and Technology	3950	12.94	95049	24.06	141	1.25	8800	62.41
Chemistry	2997	9.82	64667	21.58	975	8.64	31130	31.93
Materials Science	2522	8.26	21926	8.69	2314	20.5	17592	7.6
Polymer Science	708	2.32	11452	16.18	234	2.07	5663	24.2
Others Subject Fields	13017	42.65	239911	18.43	3252	28.81	120293	36.99
Total	30523		508318		11286		244865	

China with a total of 225 subject fields, supported by funding agencies on thin film during 2001 to 2019 the total paper publications are 41809 and 753183 citations, funding agencies supported papers published 30523 and ranked first for the highest paper published in *Physics* 7329 (24.01%), 75313 citation with 10.28 ACPP, *Science and Technology* 3950 (12.94%), 95049 citations with 24.06 ACPP second-ranked, *Chemistry* 2997 (9.82%), 64667 citations with ACPP 21.58 third-ranked, *Materials Science* 2522 (8.26%), 21926 citations with 8.69 ACPP, *Polymer Science* 708 (2.32%), 11452 citations with 16.18 ACPP paper published, the remaining other subjects the papers published were 13017 with 42.65 percentage output. China's Un-funded for 159 subjects, highest subject filed was for *Physics* 4370 (38.72%), 61387 Citation with 14.05 Average citation per paper, *Science and Technology* 141 (1.25%) paper, 8800 citations with 62.41 ACPP, *Chemistry* 975 (8.64%) 31130 Citation 31.93 ACPP, *Materials Science* 2314 (20.5%) and *Polymer Science* 234 (2.07%), the remaining others subject fields paper published 3252 (28.81%) 120293, ACPP 36.99 total output.

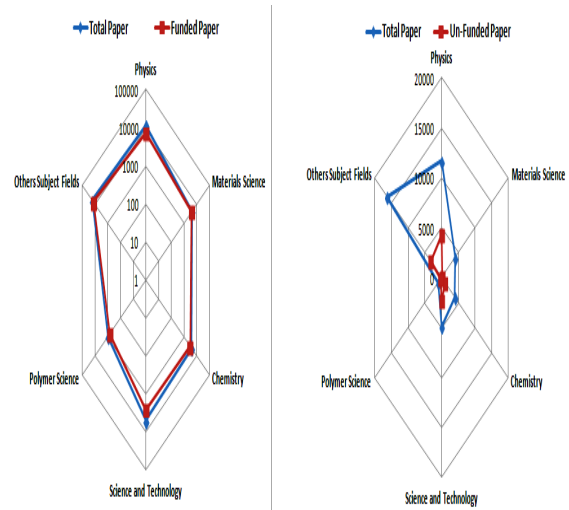


Fig.6 Subject Fields Funded and Un-Funded Papers China

I. India country Funding Agencies Top Five Journals

A medium through which a message is transmitted to its intended audiences, such as print media or broadcast (electronic) media. Thus channels of communication play a vital role in disseminating thoughts, views, and ideas. India's country totals 857 journals published and funding agencies supported 646 journals only. Indian has contributed 16308 research papers out of which 8724 papers are published with the help of funding agencies and total 857 journals published with funds supported for 646 journals only. Authors preferred *Journal of Materials Science: Materials in Electronics Journal* to publish 452 paper (5.18%), 2532 citation with 5.60 ACPP research publications thus it is considered as a highly preferred journal. Table no. 9, *Journal of Alloys and Compounds Journal* 410 papers (4.70%), 7257 citations with 17.70 ACPP published, *Applied Surface* 282 papers (3.23%),

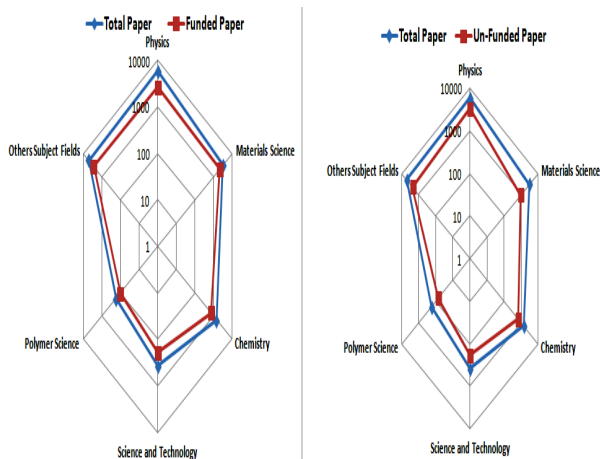


Fig.5 Subject Fields Funded and Un-Funded Papers India

4652 citations with 16.50 ACPP published, the remaining Others Journals 643 journals paper published below than

only 3.20% during the research study 2001 to 2019 field of thin film .

TABLE IX TOP FIVE JOURNALS OF FUNDED RESEARCH BY INDIA

Name of the Journals	Papers	%	Citations	ACPP
Journal of Materials Science: Materials in Electronics	452	5.18	2532	5.6
Journal of Alloys and Compounds	410	4.7	7257	17.7
Applied Surface Science	282	3.23	4652	16.5
Journal of Applied Physics	279	3.2	2886	10.34
Royal Society of Chemistry Advances	266	3.05	3045	11.45
Others Journals	7035	80.64	83205	11.83
Total	8724		103577	

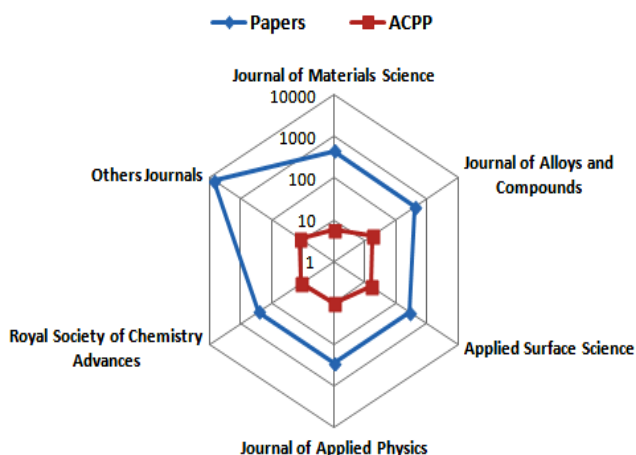


Fig.7 Top Five Journals of funded research by India

J. China country Funding Agencies Top Five Journals

The following tables no. 10 Chinese emphases on the Top five journals which have published the highest number of research publications published in the field of thin-film during 2001-2019.

Chinese country's total of 1138 journals published and funding agencies supported 995 journals. India has contributed 41809 research papers in which 30523 papers are published with the help of funding agencies and a total of 1138 journals published and funding supported 995 journals only, preferred Journal of Alloys and Compounds Journal to publish 1223 paper (4.01%), 15373 citations with 12.57 ACPP research publications considered as a highly preferred journal. Table no. 10, Applied Surface Science Journal 1179 papers (3.86%), 15709 citations with 13.32 ACPP published, Royal Society of Chemistry Advances 861 papers (2.82%), 7895 citations with 9.17 ACPP published, the remaining Others Journals 992 journals paper published below than only 2.44% during the research study 2001 to 2019 field of Thin Film.

TABLE X TOP FIVE JOURNALS OF FUNDED RESEARCH BY CHINA

Name of the Journals	Papers	%	Citations	ACPP
Journal of Alloys and Compounds	1223	4.01	15373	12.57
Applied Surface Science	1179	3.86	15709	13.32
Royal Society of Chemistry Advances	861	2.82	7895	9.17
Applied Physics Letters	744	2.44	15039	20.21
ACS Applied Materials & Interfaces	723	2.37	16082	22.24
Others Journals	25793	84.5	438220	16.99
Total	30523		508318	

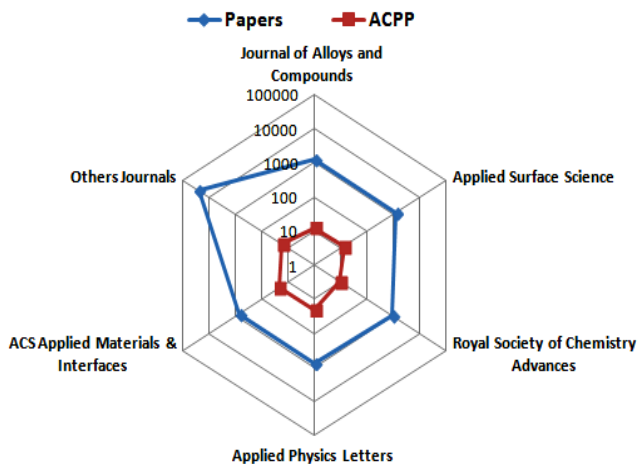


Fig.8 Top Five Journals of funded research by China

K. Type of Funding Sources

To quantify the difference of funding sources of 5 countries, the ratio of proportions of different funding agencies was calculated as suggested by (Wang, Liu, Ding, & Wang, 2012).

$$R_{1,2}=P_1/P_2, R_{2,3}=P_2/P_3$$

Where P_1 , P_2 and P_3 denote the proportion of papers supported by the 1st, 2nd, and 3rd funding agency in one country. $R_{1,2}$ is the ratio of P_1 to P_2 and $R_{2,3}$ is the ratio of P_2 to P_3 . Here, threshold is set as 2. The conditions for three type of funding sources as follows:

Firstly, the 'Single funding agency predominated' is $R_{1,2} > 2$, $P_1 > 30\%$, Secondly, the 'Double funding agency predominated' is $R_{1,2} < 2$, $R_{2,3} > 2$, $P_2 > 10\%$ and thirdly, the 'Funding source diversified' is $R_{1,2} < 2$, $R_{2,3} < 2$. In this study, China belongs to Single funding agency predominated type as the 2 conditions are satisfied, i.e. $R_{1,2}$ is greater than 2 and another condition is P_1 is greater than 30%. Whereas, the funding sources of India belong to 'funding source diversified' type as the $R_{1,2}$ and $R_{2,3}$ are less than 2, which means the gaps among the proportions of the top 3 funding agencies are rather close.

VIII. CONCLUSION

In this study, a Scientometric analysis was performed to show the current status of funding agencies to support research on thin-film research published in India and China. China was contributing 41,809 records and 30,523 funded papers on thin film contributing to 73.01%. The study found that China had published the maximum number of documents with financial support providing 30523 records. India was contributing to 16,308 records with 8724 funded thin-film papers contributing to 53.50%. India has a total of 857 journal publications with funding supported for 646 journals only and China has a total of 1138 journal publications, including 995 journals supported by funding agencies. India has the very lowest paper published from the founding agency and Chinese country having highly paper published through funding agency indicates that Chinese country development in the field of science and technology is huge.

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