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Journal self-citation study for semiconductor literature: Synchronous and diachronous approach ☆

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Abstract

The present study investigates the self-citations of the most productive semiconductor journals by synchronous (self-citing rate) and diachronous (self-cited rate) approaches. Journal's productivity of 100 most productive semiconductor journals was gathered from INSPEC database, 1978–1997 through OVID. Data of citation frequency were obtained from the Science Citation Index (SCI), Journal Citation Reports (JCR) 2001 CDROM edition by the title-by-title search. The self-citing and self-cited data were drawn from the Citing Journal Listing and the Cited Journal Listing of the JCR CDROM version 1990–2001. Self-citing and self-cited rates were determined by the method suggested by the JCR. Eighty-seven journals common to INSPEC and JCR in semiconductor were selected as the object of this study and were listed for statistical tests. The results of the present study demonstrate that high self-citing journals are usually older than low self-citing journals. In contrast to the self-citing data, the journal self-cited rate is not closely related to the publication year but reflects the characteristics of various journals. Journals with a short time interval of publication are more possible with high self-citing and self-cited rates. Journals with higher self-citing rate tend to be more productive and receive more citation than journals with lower self-citing rate. The journal self-cited rate has no association with the number of articles that a journal published and the citation it received. A journal with a higher self-citing rate tends to be cited more by itself. The mean self-citing rate is 9.59% and the mean self-cited rate is 15.03%. There is a significant difference between self-citing and self-cited rates within the same set of journals.

Keywords: Analysis; Citation analysis; Journal self-citing; Journal self-cited; Self-citation; Synchronous vs. diachronous; Semiconductor journals

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1. Introduction

The scholarly journal has been usually employed as a fundamental unit for analysis by many bibliometricians. This is because (1) the scholarly journal is the major platform for recording and communicating research and other scholarly activities in the sciences; (2) in research libraries, a significant proportion of the budget is used for purchasing the scholarly journals and other periodicals; and (3) ISI Thompson publishes *Journal Citation Reports*, *Science Citation Index*, *Social Sciences Citation Index*, and other citation index tools (White & McCain, 1989). Especially, scientific journals play an important role in research assessment in terms of their citation analysis. Indeed, journal citation analysis has become a dominant research technique with applications in various disciplines. One of the limitations of using citation to measure the quality or reputation of a journal is the phenomenon of self-citation (Lawani, 1977). The ISI defines self-citation as ''when a journal article cites an article from the same journal''. In fact, self-citations often make up a significant portion of the citations a journal gives and receives each year (ISI Web of Knowledge, 2004). MacRoberts and MacRoberts (1989, p. 344) commented that self-citation has been frequently mentioned as a potential problem, because it constitutes approximately 10–30% of all citations.

Lawani (1982, p. 281) classified self-citation into two types, synchronous and diachronous. Following Lawani's definition, an author's synchronous self-citations are those contained in the references the author gives pointing backwards in time, whereas diachronous ones are those included in the citations an author receives. On the other hand, the ISI has defined the self-citing rate as the ratio between the number of times a journal cites itself and the number of total references it makes; and the self-cited rate as the number of times it is cited by itself over all citations by all journals including itself (SCI JCR CDROM, 2001). According to Lawani's and ISI's definitions, it may be concluded that synchronous self-citation is self-citingness and diachronous one is self-citedness.

Journal publication is usually the single most prevalent form of scientific dissemination. For example, in the domain of semiconductor, the journal articles contribute 66.85% of the total literature (Tsay, Jou, & Ma, 2000, p. 495). Semiconductors have been used widely for simple switch equipments as well as high-performance computers since they were discovered. The advance of semiconductors has brought along the development of other industries, such as electronics. The research in the semiconductor science plays a significant role in the development of science and technology due to its interdisciplinary nature. By applying the Pearson correlation coefficient and Spearman rank order coefficient test for the most productive journals in the domain of semiconductor, Tsay and Ma (2003) found that there is a significant correlation between journal productivity and citation frequency, and between journal productivity and impact factor. However, for the semiconductor literature, it is still not known whether the most productive journals or most cited journals are also journals with the highest self-citing or self-cited rate. It is, therefore, of significant interest to study the characteristics of journal self-citations and their relations with other bibliometric properties of the journal.

Several previous studies analyzed self-citations synchronously. The results of these works have shown that the self-citation rates may be different among various disciplines. The diachronous self-citation rates, on the other hand, may differ from those calculated synchronously. In some bibliometric studies of research performance the percentage of diachronous self-citations has been included as a critical indicator (Aksnes, 2003). Lipetz (1999) examined different aspects of JASIS authorship through five decades. One of his findings was that the percentage of articles containing any journal self-citation increased more or less linearly over the time, from 24% in 1955 to 82% in 1995. Peritz and Bar-Ilan (2002) studied the extent to which the field of bibliometrics and scientometrics makes use of sources outside the field. One of their results shows that when comparing two periods, journal self-citation (i.e., references to the journal *Scientometrics*) increased considerably, from 12.9% (136 journal self-citation) in 1990 to 20.1% (354 journal self-citation) in 2000. Nisonger (2000) investigated the use of the ISI's JCR for journal management in academic libraries. He explored the impact of journal self-citation on JCR rankings of library and information science and genetics journals in 1994. His study showed that the overall self-citation rate in 1994 for LIS journals was 27%, and 11.7% for genetics journals. Journal rankings by impact factor and total citations received were recalculated with journal self-citations removed, and concluded that librarians may use JCR data without correcting for journal self-citation.

Maczelka and Zsindely (1992), based on JCR data for twenty-two new chemistry journals, discovered that the self-citation rate was high immediately following a journal's founding but then decreased during the first two years of the journal's existence and finally stabilized after four or five years. Fassoulaki, Paraskeva, and Garabinis (2000) calculated the self-citing rate and self-cited rate for six anaesthesia journals and found that all six journals had a self-citing rate higher than the citing rates they gave to the other journals. They also explored the relationship between journal self-citation and its impact factor, and found a significant correlation between self-citing rates and impact factor. In addition, the citation each journal gave to other journals, including itself, and the citations each journal received from the other journals differed significantly among the six journals. Rousseau (1999) clarified the citation structure of journals in terms of self-citing and self-cited rates, and found that self-cited rates reach an earlier peak than external citation. Garfield (1974, p. 192) compared both the self-citing and self-cited ratios for twenty most cited journals of science and observed that, in most cases, leading journals have a smaller self-cited than self-citing ratio. However, Garfield did not perform any statistical test to ensure the conclusion and a major limitation with most previous studies is their small sample size.

The objectives of this study are to measure the self-citations of the most productive semiconductor journals by synchronous (self-citing rate) and diachronous (self-cited rate) approaches and to investigate, for the semiconductor literature, the nature of journal self-citation in terms of journal's age and the journal publication frequency. In addition, the relationship between journal self-citation and journal productivity, between journal self-citation and journal citation frequency, and between journal self-citing rate and journal self-cited rate, respectively, are explored. Moreover, the difference of self-citing rate and self-cited rate are examined by a statistical test.

2. Methodology

The literature review in the above section suggests the following hypotheses for the subject of semiconductor literature:

1. There is an association between journal productivity and journal self-citing and self-cited rate.
2. There is an association between journal citation frequency and journal self-citing and self-cited rate.
3. There is an association between journal self-citing rate and journal self-cited rate.
4. There is a significant difference between the mean of journal self-citing rate and journal self-cited rate.

The self-citation of the most productive journals in semiconductor is investigated in this study. As the literature demonstrated, an obvious criterion for the evaluation of journals is that of productivity, which can be expressed as the number of papers published by a journal in a specific subject field during a particular period of time. Journal's productivity of 100 most productive semiconductor journals was gathered from the INSPEC database, 1978–1997 through OVID with search command "semiconductor?.de." in Tsay et al. (2000) study. In total, 1877 journals published 184,233 semiconductor articles from 1978 to 1997. Among them the first 100 journals covered 80% and the first 20 journals included 50% of the semiconductor literature.

The total citation received of a journal is examined because this is one of the most frequently used citation measures for journal assessment in the scholarly communication and serial management decision making in a library. The data of citation frequency were obtained from the Science Citation Index (SCI) JCR 2001 CDROM edition by the title-by-title search. The JCR Science edition contains data from 5752 journals in the areas of science and technology. It is an essential, comprehensive and unique resource tool for users to evaluate and compare scholarly journals by using the citation data. Moreover, it shows the relationship between citing and cited journals in a clear, easy-to-use framework (SCI JCR CDROM, 2001).

After obtaining the journal productivity and citation data, 87 journals common to INSPEC from 1978 to 1997, and JCR in semiconductor were selected as the object of this study and were listed for statistical tests. The Pearson correlation was applied to determine the correlation coefficient between journal productivity and self-citations, between journal citation frequency and self-citations, and between self-citing rate and self-cited rate. The difference of the mean between self-citing and self-cited rate was examined by the t-test.

The self-citing and self-cited data were drawn from the Citing Journal Listing and the Cited Journal Listing of the *Journal Citation Reports* (JCR). Self-citing and self-cited rates were determined by the method suggested by the JCR. For example, in 2001 the journal *Applied Physics Letters* was cited 80,915 times. Of those citations, 9,173 were self-citations. Its self-cited rate was therefore 9,173/80,915 or 11.34% for the year 2001. In contrast, in the references of articles published by *Applied Physics Letters* in the same period, there were 43,231 citations. Its self-citing rate, therefore, was 9,173/43,231 or 21.22% for the same period. The analysis of the present study was based on the JCR CDROM version 1990–2001, which were available at the time of the present study in 2001. Journal's self-citation rate was calculated yearly. Consequently, each journal possessed 12 self-citation rates and the average self-citation rate for the study period was decided.

3. Results and discussion

3.1. Nature of self-citing data

Table 1 illustrates the journal distribution based on an even self-citing rate interval. The table indicates that the largest group is that with the least self-citing rates, i.e., with the self-citing rate less than 5%, which accounts for 29 journals (33.3%). The second largest group is that with the self-citing rate between 5% and 10%, which contributes 23 journals (26.4%). These two groups of journals constitute 59.7% of the 87 journals of the present study. This indicates that about 60% of journals under study are with the self-citing rate being less than 10%. The number of journals becomes less and less as the self-citing rate increases.

In Tables 2(a) and 2(b), 20 highest and 20 lowest self-citing journals including papers in semiconductor are ranked by the self-citing rate in descending order, respectively. The journal *IEEE Transactions on Microwave Theory and Techniques* has the highest self-citing rate of 31.4%, while the journal with the lowest self-citing

Table 1
Distribution of journal self-citing rate in semiconductor literature

Self-citing rate	<5%	5–10%	10–15%	15–20%	20–25%	25–30%	30–35%	Total
Number of journals	29	23	17	9	5	3	1	87
%	33.3	26.4	19.5	10.3	5.7	3.4	1.1	100

Table 2(a)
Self-citing rate, publication date, publication frequency of highest self-citing journals

Rank	Journal name	Self-citing (%)	Publication date	Publication frequency
1	IEEE Transactions on Microwave Theory and Techniques	31.37	1953	16
2	IEEE Transactions on Nuclear Science	26.79	1954	6
3	IEEE Journal of Solid-State Circuits	26.73	1966	12
4	Physical Review. B, Condensed Matter	26.39	1893	48
5	Nuclear Instruments & Methods in Physics Research Section *A*-Accelerators Spectrometers Detectors and Associated Equipment	21.93	1957	57
6	Applied Physics Letters	21.79	1962	52
7	IEEE Transactions on Electron Devices	21.75	1952	12
8	Optics Letters	21.03	1977	24
9	Physical Review Letters	20.62	1958	52
10	Applied Optics	19.26	1962	36
11	Physica C: Superconductivity and its Applications	18.75	1934	68
12	Electronics Letters	18.25	1965	26
13	Journal of the Electrochemical Society	18.09	1902	12
14	IEEE Journal of Quantum Electronics	17.14	1965	12
15	IEEE Photonics Technology Letters	16.78	1989	12
16	Nuclear Instruments & Methods in Physics Research Section *B*-Beam Interactions with Materials and Atoms	16.62	1957	57
17	Synthetic Metals	15.57	1980	24
18	Soviet Physics: Semiconductors	15.08	1967	12
19	Journal of Non-Crystalline Solids	14.74	1969	54
20	Journal of the Physical Society of Japan	14.70	1946	12

Table 2(b)
Self-citing rate, publication date, publication frequency of lowest self-citing journals

Rank	Journal name	Self-citing (%)	Publication date	Publication frequency
68	Applied Surface Science	4.10	1978	68
69	Journal of Physics and Chemistry of Solids	4.09	1956	12
70	Philosophical Magazine *B*-Physics of Condensed Matter Statistical Mechanics Electronic Optical and Magnetic Properties	3.94	1798	12
71	Physica Scripta	3.86	1982	Irregular
72	Journal of Materials Science Letters	3.50	1982	24
73	Europhysics Letters	3.41	1986	24
74	Canadian Journal of Physics	3.09	1929	12
75	Acta Physica Polonica A	3.03	1932	12
76	Applied Physics *A*-Materials Science & Processing	2.77	1973	12
77	Materials Letters	2.32	1982	30
78	Il Nuovo Cimento D	2.28	1855	15
79	Superlattices and Microstructures	2.27	1985	12
80	Materials Chemistry and Physics	1.93	1976	15
81	Materials Science Forum	1.88	1984	30
82	IEICE Transactions on Electronics	1.38	1976	12
83	Microelectronics Journal	1.35	1967	12
84	Materials Science and Engineering *B*-Solid State Materials for Advanced Technology	1.11	1988	27
85	Journal De Physique IV	0.96	1991	6–8
86	Acta Physica Sinica	0.18	1992	12
87	Electronics and Communications in Japan Part II-Electronics	0.08	1963	12

rate is *Electronics and Communications in Japan. Pt.2: Electronics* (0.1%). The table also lists the initiative publication date and the frequency of publication, taken from JCR on CDROM (2001 Science Edition) and Ulrich's on Disc 2001. It can be seen from Table 2(a) that most journals, 9 out of 20, with a high self-citing rate were first published during the period from 1961 to 1980, 7 out of 20 from 1941 to 1960, and 3 out of 20 before 1940. In total, 19 out 20 journals with high self-citing rates were first published before 1980, including one in 1980. On the other hand, Table 2(b) indicates that most journals, 9 out of 20, with low self-citing rates were first published after 1980. Although there are two very old journals in Table 2(b), it is apparent that journals with high self-citing rate are generally older than journals with low self-citing rate. This finding is consistent with the comment of So (1990) that "for younger journals, their self-citing rates appear to be lower". Two out of the 20 highest self-citing journals have been published for more than 100 years. Table 2(a) indicates that the *Physical Review B. Condensed Matter* is 112 years old and the *Journal of Electrochemical Society* is 102 years old. An old journal is usually well-established and known world wide. With more available to be cited, such journals tend to cite themselves more than others.

The self-citing rate is also strongly related to the publication frequency, which may be changed occasionally, presumably seldom. The numbers shown in Tables 2(a) and 2(b) were the data of 2001. Table 2(a) shows that the highest self-citing journals (>14.7 and <31.4) are likely to be published weekly, whereas monthly journals tend to be the lowest self-citing ones. Seven out of the 20 highest self-citing journals are published approximately weekly and four roughly biweekly. On the other hand, for those with low self-citing rates (>0.1% and <4.1%), there are 10 monthly journals and two journals each published 15 times yearly. This discovery confirms Pichappan's (1995, p. 20) proposition that "if a journal revises its policy of increasing the frequency of its publication, its self-citations are likely to increase".

3.2. Nature of self-cited data

The self-cited rates for the 87 semiconductor journals of the present study fall between 2.05% and 38.85%. *Nuclear Instruments and Methods Physics Research Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment* ranks number one, whereas *Canadian Journal of Physics* is the journal with the lowest self-cited rate. Table 3 indicates that the largest group is that with the self-cited rate from 10% to 15%, which accounts for 27 journals, followed by the second largest group (19 journals) with the self-cited rate from 5% to 10%. These two groups constitute 52.8% of the 87 journals under study. All other rate intervals, except for the self-cited rate greater than 35%, contain roughly the same number of journals, i.e., five to seven journals. There are eight journals that have the self-cited rate greater than 30%. Among them three are nuclear oriented journals; four are published by the Elsevier and three by the IEEE.

Tables 4(a) and 4(b) list the 20 highest and 20 lowest self-cited journals, including articles in semiconductor ranking by the self-cited rate in descending order, together with the publication date and frequency. The table shows that the distribution of publication date for both high and low self-cited journals is quite random. This indicates that, in contrast to the self-citing data, the journal self-cited rate is not closely related to the publication year but reflects the characteristics of various journals. On the other hand, the journal self-cited rate is associated with the publication frequency. Table 4 displays that there are five high self-cited journals (>20.0 and <38.85) publishing more than 53 times yearly, whereas no journal with the lowest self-cited rate (>2.05% and <8.97%) has such high publication frequencies, and only one with 52 issues yearly. There are 9 out of 20 journals with a publication frequency equal to or less than 12 times yearly falling into the category of low self-cited journals. It is apparent that journals with a short time interval of publication are more possible with high self-cited rates. This is similar to that for the case of self-citing.

Table 3
Distribution of journal self-cited rate in semiconductor literature

Self-cited rate	<5%	5–10%	10–15%	15–20%	20–25%	25–30%	30–35%	>35%	Total
Number of journals	5	19	27	6	6	6	7	1	87
%	5.7	21.8	31	6.9	6.9	6.9	8	1.1	100

Table 4(a)
Self-cited rate, publication date, publication frequency of highest self-cited journals

Rank	Journal name	Self-cited (%)	Publication date	Publication frequency (times/year)
1	Nuclear Instruments & Methods in Physics research Section *A*-Accelerators Spectrometers Detectors and Associated Equipment	38.85	1957	57
2	Nuclear Instruments & Methods in Physics Research Section *B*-Beam Interactions with Materials and Atoms	34.67	1957	57
3	IEEE Transactions Nuclear Science	31.69	1954	6
4	IEEE Transactions on Microwave Theory and Techniques	31.46	1953	16
5	IEEE Journal of Solid-State Circuits	30.75	1966	12
6	Diamond and Related Materials	30.65	1991	12
7	Sensors and Actuators *A*-Physical	30.32	1981	24
8	Soviet Physics: Semiconductors	30.05	1967	12
9	Physical Review. B, Condensed Matter	28.31	1893	48
10	Physica *C*-Superconductivity and its Applications	28.31	1934	68
11	Sensors and Actuators *B*-Chemical	26.45	1981	24
12	Journal of Crystal Growth	26.15	1967	52
13	Surface Science	25.47	1964	78
14	Ukrainskii Fizicheskii Zhurnal	25.18	1956	12
15	Soviet Physics. Technical Physics	22.21	1931	12
16	Synthetic Metals	22.05	1980	24
17	Journal of Lightwave Technology	21.78	1983	12
18	Applied Optics	20.98	1962	36
19	Journal of Non-Crystalline Solids	20.13	1969	54
20	IEEE Photonics Technology Letters	20.00	1989	12

Table 4(b)
Self-cited rate, publication date, publication frequency of lowest self-cited journals

Rank	Journal name	Self-cited %	Publication date	Publication frequency (times/year)
68	Physical Review Letters	8.97	1958	52
69	Physica Status Solidi *A*-Applied Research	8.74	1970	8
70	Journal of Materials Science Letters	8.49	1982	24
71	Material Chemistry and Physics	8.18	1976	15
72	Materials Letters	7.29	1982	30
73	Journal De Physique IV	7.15	1991	6–8
74	Superlattices and Microstructures	6.82	1985	12
75	Philosophical Magazine *B*-Physics of Condensed Matter Statistical Mechanics Electronic Optical and Magnetic Properties	6.57	1798	12
76	Soviet Physics, JETP	6.45	1955	12
77	Materials Science and Engineering *B*-Solid State Materials for Advanced Technology	6.19	1988	27
78	Zeitschrift fur Physik B: Condensed Matter	6.02	1963	24
79	Solid State Technology	5.74	1958	12
80	Solid State Communications	5.46	1963	48
81	Letters to the Journal of Experimental and Theoretical Physics	5.19	1965	24
82	Applied Physics *A*-Materials Science & Processing	5.12	1973	12
83	Journal of Physics and Chemistry of Solids	4.33	1956	12
84	Europhysics Letters	4.10	1986	24
85	Material Science Forum	3.92	1984	30
86	Electronics and Communications in Japan Part II-Electronics	3.45	1963	12
87	Canadian Journal of Physics	2.05	1929	12

3.3. Statistical tests

Statistical tests were conducted to examine the four hypotheses stated previously in the section of Methodology for the 87 most productive journals in semiconductor. The underlying data are presented in Appendix 1. The Pearson correlation tests were conducted to examine if there is a significant correlation between two sets of citation data of interest. The t-test was conducted to determine the mean difference between self-citing rates and self-cited rates. The results of these tests are summarized in what follows.

There is a significant correlation between self-citing rates and journal productivity ($r = 0.372$, $p < 0.05$) and between self-citing rates and citation frequency ($r = 0.449$, $p < 0.05$), as the critical r value for $P = 0.05$ is 0.211 for the present sample size of 87 or the degree of freedom of 85. (Minium & Clarke, 1982, Appendix H, p. A52). In other words, journals with higher self-citing rate tend to be more productive and receive more citation than journals with lower self-citing rate. On the contrary, journals with lower self-citing rate contribute fewer articles and would be cited less than journals with higher self-citing rate.

There is no significant correlation between self-cited rates and journal productivity ($r = 0.156$, $p = 0.148 > 0.05$) and between self-cited rates and citation frequency ($r = 0.106$, $p = 0.329 > 0.05$). It, therefore, can be concluded that the journal self-cited rate has no association with the number of articles that journal published and citation it received.

There is a significant correlation between self-citing rates and self-cited rates ($r = 0.669$, $p < 0.05$). That is, a journal with a higher self-citing rate tends to be cited more by itself. Further examination of both sets of self-citation data reveals that, for all 87 journal titles, the mean self-cited rate (15.03%) is greater than the mean self-citing rate (9.59%). The t-test shows, as Table 5 demonstrates, that the difference is 5.4%. The t-test for the

Table 5
Mean difference of self-citing and self-cited rate

	Mean	SD	t	p-value
Self-citing rate	9.59%	7.06%	8.137	0.000
Self-cited rate	15.03%	8.09%		

paired difference between these two kinds of self-citation rates are computed by SAS. The paired *t*-test also determined the probability that the absolute value of the mean difference was greater than zero by chance alone. The probability of the difference occurring by chance is 0.000. Therefore, it can be concluded that the mean difference is highly significant ($t = 8.137$, $p < 0.05$). This result rejects the null hypothesis that there is no significant difference between self-citing and self-cited rates.

4. Summary and conclusions

The present work explores the self-citations of 87 most productive semiconductor journals by both synchronous and diachronous approaches. The following conclusions may be drawn from the results of the present study.

1. High self-citing journals tend to be older than low self-citing journals. An old journal is usually well-established and known world wide. With more available to be cited, such journals tend to cite themselves more than others.
2. In contrast to the self-citing data, the journal self-cited rate is not closely related to the publication year but reflects the characteristics of various journals.
3. Journals with a short time interval of publication are more possible with high self-citing and self-cited rates.
4. Journals with higher self-citing rate tend to be more productive and receive more citation than journals with lower self-citing rate. On the contrary, journals with lower self-citing rate contribute fewer articles and would be cited less than journals with higher self-citing rate.
5. The journal self-cited rate has no association with the number of articles that journal published and the citation it received.
6. A journal with a higher self-citing rate tends to be cited more by itself. There is a significant mean difference between self-citing and self-cited rates within the same set of journals. The mean self-cited rate (15.03%) is 5.4% greater than the mean self-citing rate (9.59%).

The self-citation of a journal is a complicated phenomenon and is influenced by many factors. As demonstrated by the present study, both the age and publication frequency may have significant effect on the self-citation of the journal. On the other hand, the significant correlation between self-citing rates and citation frequency may indicate a significant influence of self-citations on the total citation the journal received. As suggested by Garfield (1974, p.194), the journal self-citation has nothing to do with good or bad. It says something about the characteristic of a particular journal. The reason why a journal self-citation occurred may include that authors publish a series of their works in the same journal, or that an author prefers to submit his paper to a journal that has previously published works related to his study. However, further investigations are needed to confirm this point.

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Appendix 1

Self-Citing and Self-cited Rates for 87 Most Productive Semiconductor Journals (Ranked by journal productivity)

Rank	Journal	Citing frequency	Self-citing rate (%)	Self-citation frequency	Cited frequency	Self-cited rate (%)
1	Appl. Phys. Lett	310,449	21.79	67,644	519,689	13.02
2	Phys. Rev. B. Condens. Matter	1,227,598	26.39	324,009	1,144,331	28.31

Appendix 1 (*continued*)

Rank	Journal	Citing frequency	Self-citing rate (%)	Self-citation frequency	Cited frequency	Self-cited rate (%)
3	J. Appl. Phys.	517,813	13.77	71,293	482,909	14.76
4	Jpn. J. Appl. Phys.	229,046	11.53	26,419	186,418	14.17
5	J. Cryst. Growth	282,564	11.33	32,023	122,450	26.15
6	Electron. Lett.	80,870	18.25	14,762	99,782	14.79
7	Sov. Phys.-Semicond.	11,833	15.08	1785	5941	30.05
8	IEEE Trans Electron Devices	60,852	21.75	13,238	72,903	18.16
9	Surf. Sci.	560,600	11.92	66,843	262,465	25.47
10	J. Vac. Sci. Technol. B	97,903	11.58	11,338	71,919	15.76
11	Semicond. Sci. Technol.	51,908	4.18	2168	19,661	11.03
12	Solid State Commun.	128,634	6.08	7821	143,222	5.46
13	Solid State Electron	49,789	8.80	4380	31,184	14.05
14	Thin Solid Films	157,315	8.63	13,584	94,951	14.31
15	J. Electrochem. Soc.	166,911	18.09	30,191	181,082	16.67
16	Phys. Rev. Lett.	473,610	20.62	97,663	1,089,332	8.97
17	Appl. Surf. Sci.	97,990	4.10	4020	36,377	11.05
18	Nucl. Instrum & Methods J. Phys. Res. B. Beum Interact. Mater. At.	178,354	16.62	29,650	85,522	34.67
19	Phys. Status Solidi A.	78,736	5.55	4367	49,949	8.74
20	J. Vac. Sci. Technol. A. Vac. Surf. Films.	102,644	8.77	8999	80,983	11.11
21	J. Non-Cryst. Solids	127,305	14.74	18,767	93,228	20.13
22	Phys. Status Solidi B	87,755	5.75	5048	47,473	10.63
23	IEEE Photonics Technol Lett.	38,544	16.78	6,467	32,330	20.00
24	Sov. Phys.-Solid State.	13,810	11.06	1528	9194	16.62
25	IEEE J. Quantum Electron.	66,629	17.14	11,423	85,604	13.34
26	Mater. Sci. Eng. B. Solid-State Mater. Adv. Technol.	48,891	1.11	542	8,762	6.19
27	J. Phys. Condens. Matter.	221,569	4.64	10,283	72,052	14.27
28	IEEE Electron Device Lett.	17,409	12.65	2202	24,181	9.11
29	Mater. Sci. Forum.	9152	1.88	172	4387	3.92
30	J. Electron. Mater.	42,515	4.42	1881	18,405	10.22
31	Superlattices Microstruct.	24,363	2.27	553	8106	6.82
32	Nucl. Instrum. Methods Phys. Res. A. Accel. Spectrom. Detect. Assoc. Equip.	150,875	21.93	33,090	85,174	38.85
33	Sov. Tech. Phys. Lett.	3140	8.31	261	1603	16.28
34	Physica B.	130,913	4.41	5769	49,236	11.72
35	Acta Phys. Pol. A	34,974	3.03	1060	6991	15.16
36	Inorg. Mater.	30,421	4.67	1421	7936	17.91
37	Microelectron. Eng.	13,889	4.26	591	4645	12.72
38	Sensor Actuat *A*-Phys.	26,842	11.80	3168	10,449	30.32
39	IEEE Trans. Nucl. Sci.	45,332	26.79	12,143	38,318	31.69
40	Physica C.	180,436	18.75	33,830	119,494	28.31
41	J. Phys. IV.	48,617	0.96	467	6532	7.15
42	J. Phys. C. Solid.	56,120	4.09	2294	52,976	4.33
43	Appl. Phys. A, Mater. Sci. Process.	48,776	2.77	1350	26,366	5.12
44	Diam. Relat. Mater.	33,431	12.37	4136	13,493	30.65
45	J. Lumin.	34,649	6.18	2143	21,693	9.88

(*continued on next page*)

Appendix 1 (*continued*)

Rank	Journal	Citing frequency	Self-citing rate (%)	Self-citation frequency	Cited frequency	Self-cited rate (%)
46	J. Mater. Sci. Lett.	55,347	3.84	2128	25,060	8.49
47	JETP Lett.	31,814	6.81	2167	41,738	5.19
48	J. Lightwave Technol.	49,710	14.08	7,000	32,135	21.78
49	Opt. Lett.	72,240	21.03	15,191	106,987	14.20
50	Sensor Actuators B. Chem	35,472	13.84	4,908	18,553	26.45
51	Phys. Scr. Vol. T.	80,297	3.86	3096	31,488	9.83
52	J. Mater. Sci.	175,275	7.54	13,208	102,586	12.88
53	Synth. Met.	90,561	15.57	14,103	63,948	22.05
54	Cryst. Res. & Technol.	24,065	5.38	1294	6960	18.59
55	J. Mater. Res.	84,737	5.20	4410	41,437	10.64
56	Appl. Opt.	158,259	19.26	30,484	145,333	20.98
57	Sol. Energy Mater. Sol. Cells.	19,624	5.15	1011	6256	16.16
58	IEEE Trans. Microw. Theory Tech.	50,769	31.37	15,924	50,613	31.46
59	Philos. Mag. B. Phys. Condens. Matter.	39,493	3.94	1556	23,692	6.57
60	Ukr. Fiz. Zh.	5805	5.36	311	1235	25.18
61	Rev. Sci. Instrum.	116,756	13.16	15,368	90,459	16.99
62	J. Phys. D. Appl. Phys.	73,666	7.47	5504	42,942	12.82
63	J. Phys. Soc. Jpn.	123,688	14.70	18,185	117,977	15.41
64	Phys. Lett. A.	158,019	6.75	10,669	111,010	9.61
65	Mater. Lett.	31,649	2.32	733	10,053	7.29
66	Vacuum.	39,255	4.39	1722	15,091	11.41
67	Sol. Cells.	1788	9.51	170	1497	11.36
68	Opt. Commun.	102,981	9.05	9315	65,869	14.14
69	IEEE J. Solid-State Circuits	27,823	26.73	7436	24,182	30.75
70	IEICE Trans. Electron.	13,984	1.38	193	1179	16.37
71	Solid State Technol.	5433	7.31	397	6917	5.74
72	Sov. Phys.-Tech. Phys.	7729	7.66	592	2666	22.21
73	Can. J. Phys.	23,447	3.09	724	35,359	2.05
74	J. Opt. Soc. Am. B. Opt. Phys.	76,011	8.27	6283	57,868	10.86
75	Electron. Commun. Jpn. 2. Electron.	5079	0.08	4	116	3.45
76	J. Solid State Chem.	79,791	10.73	8558	55,859	15.32
77	Acta Phys. Sin.	8934	0.18	16	141	11.35
78	Int. J. Electron.	19,331	5.75	1111	6159	18.04
79	IEE Proc. J. Optoelectron.	5160	5.00	258	2200	11.73
80	Microelectron. J.	7161	1.35	97	783	12.39
81	Nuovo Cimento D.	23,033	2.28	526	5235	10.05
82	Europhys. Lett.	80,809	3.41	2755	67,228	4.10
83	Mater. Chem. Phys.	32,883	1.93	635	7766	8.18
84	Sov. Phys.-JETP.	14,059	10.14	1425	22,102	6.45
85	Z.Phys. B. Condens. Matter.	45,727	5.13	2348	38,979	6.02
86	Ultramicroscopy.	31,921	13.27	4236	27,640	15.33
87	Indian J. Pure Appl. Phys.	10,083	4.32	436	2194	19.87

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