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# Status of Open Access Journals in the Field of Chemistry as Indexed in Directory of Open Access Journals (DOAJ): A Study

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## Abstract

There is a growth in number of Open Access Journals (OAJs) that are setting new dimension to the ways information is published, managed and disseminated. Open Access (OA) culture has been impacting knowledge business and associated institutions. The present study intends to evaluate the status of 180 OAJs in Chemistry as indexed in Directory of Open Access Journals (DOAJ) database. Various characteristics such as Geographic and language wise distribution, Impact Factor (IF), coverage of Indexing/Abstracting databases, adopted licensing model, policy of plagiarism, adoption of Web 2.0 and related issues of the journals are examined in the paper. The results found that Hindawi Publishing Corporation from Egypt has topped with more number of publications. Chemical Abstract Service, Google Scholar and Scopus were found to be covering most of Chemistry OAJs. The study records the trend of commercial print journals switching to OAJs in Chemistry.

**Keywords:** Chemistry, Directory of Open Access Journals (DOAJ), Impact Factor (IF), Open Access Journals (OAJs), Web 2.0

## 1. Introduction

The paradigm shift happening in the information business has brought about enormous changes in ways information is collected, managed, developed and disseminated. OA movement has redefined the boundaries of new information age. In recent years many publishers are switching to OA and research is experiencing more visibility and utility. Commercial publishers are setting barriers with 'high price to access' policy and restrictive copyright policy, which have made it difficult for libraries to provide access to information[1]. Evolution of OAJs is addressing these issues and making even latest research literature available for research fraternity.

## 2. Review of Literature

Though OA concept emerged in the recent years, it has become an important movement in every branch of knowledge today as it facilitates access to the required knowledge[2]. Singh gave an account of OAJs in Library and Information Science (LIS) in Asian countries to find OAJs were gaining importance because of their accessibility[3]. The goal of OA movement is to have scholarly content freely available in digital form across the globe with minimal barriers for their use[4]. With shrinking budgets, libraries are having difficulty in subscribing to journals. OAJs are reaching readers without any obligations of copyright issues and other publisher constraints[5]. In spite of universal accessibility, there are questions about the quality of OAJs *vis-a-vis* commercial journals. The study conducted by Cummings depicted the low rate of OAJs getting indexed in databases such as Journal Citation Report (JCR) and the study acknowledged the need of nontraditional indexing/abstracting tools for OA environment[6]. A study examining the status of OA journals in developing countries based on DOAJ indicated that 13.8% of total journals were from developing countries[7].

## 3. Objectives

The objective of the study is to assess OAJs in Chemistry listed in DOAJ. The main objective is to determine geographic and language wise distribution of journals,

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prolific publishers of OAJs and proportion of journals with IF. The study also aims to ascertain the coverage of OA Chemistry journals in different abstracting and indexing databases, gap between journal's establishment and OA adoption, licensing model for content distribution, platform adopted for content hosting and formats of content distribution. The study briefly discusses the policy of Article Processing Fee (APC), plagiarism policy and adoption of Web 2.0 technology and other related issues.

## 4. Chemistry OAJs indexed in DOAJ

Chemistry has been a central branch of science and many sciences have evolved as research in Chemistry advanced. In the present society, the application of Chemistry is omnipresent. Most significant areas of modern life such as food processing, pharmaceuticals, agriculture, manufacturing industry, geology, plastic technology, biology, computer technology have been possible because of progress in Chemistry. Naturally research in chemistry has been more vigorous than ever for finding ways to make things better. OAJs have greater value in terms of rapid and wide access to latest research information with no cost involved. DOAJ lists as many as 180 titles in Chemistry which are considered for the present study.

## 5. Methodology

Metadata of complete list of journals was downloaded from DOAJ website. Under subject column, a search was made for 'Chemistry' to fetch related journals. A total of 180 journals including some interdisciplinary journals were found related to Chemistry. Through the link given in the database and Google search, websites of each journal were visited and examined for the present status of the journals. JCR was referred to obtain impact factor of the listed journals.

Out of 180 journals, websites of 4 journals were found to be inoperable and 5 journals had ceased publication but provided access to archives. 12 journals were merged with some other journals of the same publisher. For the study, including ceased publications, 164 journals have been considered and 4 journals whose websites were out of order have been omitted.

## 6. Geographic distribution

On examining the geographic distribution of journals, it is found that, out of 40 countries in the list, Egypt stands at the top with 29 (17.68%) journals followed by Switzerland with 21 (12.80%) journal. UK has been publishing 20 (12.20%) journals whereas Germany and India each have 9 (5.49%) publications (Table 1). It is a positive sign that being a developing country, Egypt is leading with highest number of journals. Egypt, Indonesia, Iran, Pakistan and Turkey which are D-8 countries have a share of 23.78% of the total OAJs. Pujar, in a similar study records developing countries doing well with number of publication in LIS[8].

**Table 1.** Geographic distribution

| Sl. No. | Country | No. of Journals | Percentage |
|---|---|---|---|
| 1 | Egypt | 29 | 17.68 |
| 2 | Switzerland | 21 | 12.80 |
| 3 | United Kingdom | 20 | 12.20 |
| 4 | Germany | 9 | 5.49 |
| 5 | India | 9 | 5.49 |
| 6 | United States | 8 | 4.88 |
| 7 | Poland | 7 | 4.27 |
| 8 | Indonesia | 6 | 3.66 |
| 9 | Netherlands | 6 | 3.66 |
| 10 | Brazil | 5 | 3.05 |
| 11 | Iran | 5 | 3.05 |
| 12 | New Zealand | 3 | 1.83 |
| 13 | Croatia | 2 | 1.22 |
| 14 | Hungary | 2 | 1.22 |
| 15 | Italy | 2 | 1.22 |
| 16 | Korea | 2 | 1.22 |
| 17 | Moldova | 2 | 1.22 |
| 18 | Serbia | 2 | 1.22 |
| 19 | Turkey | 2 | 1.22 |
| 20 | Ukraine | 2 | 1.22 |
| 21 | Other Countries | 20 | 12.20 |
| | | 164 | 100.00 |

## 7. Language-wise Distribution

Out of 164 journals 143 (87.20%) journals are proving full text articles in English alone. A single journal in Indonesian and two journals in Portuguese were also found. In the field of chemistry, 18 (10.98%) OAJs are available in multiple languages which include English,

Kazak, Russian, Spanish, Castilian, Moldavian, Moldovan, Ukrainian, Serbian, Polish, Portuguese and Indonesian. It is evident that English language is dominating the science literature and universally accepted for publishing scientific research.

## 8. Impact Factor

Impact Factor (IF) is an essential aspect of any journal for measuring the quality of articles published. JCR was considered for recording IF. As many as 40 (24.39%) journals are provided with impact factor in JCR. The top 20 journals according to their impact factor are given in Table 2. *Particle and Fibre Toxicology* is at the top with 8.649 IF followed by *DNA Research* (5.267), *Atmospheric Chemistry and Physics* (5.114). The proportion of OAJs in JCR having IF is considerably less. The need for OAJs to be included in JCR like databases has been realized in the earlier studies as well. Big-deal subscriptions found to be with better IF and this calls for self-realization for OAJs to focus more on quality while publishing research articles[5].

**Table 2.** Impact factor of OAJs in Chemistry

| Sl. No. | Journal | Impact Factor |
|---|---|---|
| 1 | Particle and Fibre Toxicology | 8.649 |
| 2 | DNA Research | 5.267 |
| 3 | Atmospheric Chemistry and Physics | 5.114 |
| 4 | Cellular Physiology and Biochemistry | 4.652 |
| 5 | Stem Cell Research & Therapy | 4.504 |
| 6 | Journal of Cheminformatics | 3.949 |
| 7 | Protein & Cell | 3.817 |
| 8 | Structural Dynamics | 3.667 |
| 9 | Arabian Journal of Chemistry | 3.613 |
| 10 | ChemistryOpen | 3.585 |
| 11 | Molecular Medicine | 3.530 |
| 12 | Clinical Proteomics | 3.476 |
| 13 | International Journal of Molecular Sciences | 3.257 |
| 14 | Catalysts | 2.964 |
| 15 | Acta Crystallographica Section E: Crystallographic Communications | 2.864 |
| 16 | BMB Reports | 2.782 |
| 17 | Beilstein Journal of Organic Chemistry | 2.697 |
| 18 | Nanoscale Research Letters | 2.584 |
| 19 | Chemistry Central Journal | 2.552 |
| 20 | Molecules | 2.465 |

## 9. Prolific Publishers

Publishers play a vital role for facilitating any journal to reach its intended users across the globe by providing OA through their websites. Hindawi Publishing (17.07%) has topped the table with 28 OAJs. MDPI AG 18 (10.98%), Springer 10 (6.10%) and Biomed Central 8 (4.88%) follow. There are two publishers with 3 (1.83%) publications, seven publishers with 2 publications (1.22%) and 68 publishers (41.46%) with single publication (Table 3).

**Table 3.** Prolific publishers

| Sl. No. | Publisher | No. of Journals | Percentage |
|---|---|---|---|
| 1 | Hindawi Publishing Corporation | 28 | 17.07 |
| 2 | MDPI AG | 18 | 10.98 |
| 3 | Springer | 10 | 6.10 |
| 4 | BioMed Central | 8 | 4.88 |
| 5 | De Gruyter Open | 7 | 4.27 |
| 6 | Elsevier | 5 | 3.05 |
| 7 | International Union of Crystallography | 3 | 1.83 |
| 8 | Libertas Academica | 3 | 1.83 |
| 9 | ACG Publications | 2 | 1.22 |
| 10 | Bentham open | 2 | 1.22 |
| 11 | Dove Medical Press | 2 | 1.22 |
| 12 | Islamic Azad University | 2 | 1.22 |
| 13 | PAGEPress Publications | 2 | 1.22 |
| 14 | Taylor & Francis Group | 2 | 1.22 |
| 15 | Wiley | 2 | 1.22 |
| 16 | Other Publishers | 68 | 41.46 |

## 10. Indexing and Abstracting

Indexing and abstracting databases give more visibility

to information sources. Their importance in the research field is more significant as they help to connect information seekers with right source in less time. It is found that Chemistry OAJs are abstracted and indexed in 530 databases across the globe. The databases include renowned national and international indexing and abstracting services in a wide range of subjects, institutional and academic repositories, citation databases, directories, journal databases and content aggregators. Apart from DOAJ where all the journals in the study are indexed, Chemical Abstract Service, Google Scholar, SCOPUS, EBSCOhost Connection, J-Gate, The Summon Service and Pubmed have topped the list with more journals included in their databases. Some publishers provide more services in different subjects and domain under one umbrella such as EBSCO and ProQuest. In such cases, each database of the same publisher is considered to be a separate entity as they target different user groups. A list of top 25 indexing and abstracting databases is presented in the Table 4. It is noticed that OA journals in chemistry have been indexed in many databases of interdisciplinary subjects since the horizon of chemistry applications is cosmic.

**Table 4.** Indexing and abstracting databases

| Sl. No. | Database | No. of Journals Covered | Percentage |
|---|---|---|---|
| 1 | DOAJ | 164 | 100.00 |
| 2 | Chemical Abstract Service | 108 | 65.85 |
| 3 | Google Scholar | 69 | 42.07 |
| 4 | SCOPUS | 61 | 37.20 |
| 5 | EBSCOhost Connection | 50 | 30.49 |
| 6 | J-Gate | 48 | 29.27 |
| 7 | The Summon Service | 40 | 24.39 |
| 8 | Pubmed | 38 | 23.17 |
| 9 | CNKI Scholar | 35 | 21.34 |
| 10 | Pubmed Central | 33 | 20.12 |
| 11 | Science Citation Index Expanded | 31 | 18.90 |
| 12 | Emerging Sources Citation Index | 28 | 17.07 |
| 13 | EBSCO Discovery Service | 27 | 16.46 |
| 14 | EMBAS Open Access Journals Integrated Service System Project Primo Central Index Web of Science WorldCat Discovery Services | 26 | 15.85 |
| 15 | AGORA | 25 | 15.24 |
| 16 | Academic OneFile | 23 | 14.02 |
| 17 | Academic Search Alumni Edition Academic Search Complete HINARI Access to Research in Health Programme Journal Citation Report | 21 | 12.80 |
| 18 | CAB Abstracts INSPEC | 20 | 12.20 |
| 19 | EBSCOhost Research Databases | 19 | 11.59 |
| 20 | Index Copernicus InfoTrac Custom journals | 18 | 10.98 |
| 21 | Expanded Academic ASAP | 17 | 10.37 |
| 22 | Airiti Library | 15 | 9.15 |
| 23 | AGRICOLA | 14 | 8.54 |
| 24 | Current Contents - Physical, Chemical & Earth Sciences | 14 | 8.54 |
| 25 | Biological Abstracts Cabell's International Cross Ref Online Access to Research in the Environment (OARE) | 13 | 7.93 |

## 11. Gap between OAJs' Establishment and OA adoption

In the present study, to ascertain the trend in OA in Chemistry, the year in which the journal was started and the year in which OA began to be provided are examined. It is found that there are 135 journals (82.32%) which gave OA to journals right from the year of establishment of

the journal. Among these journals, many journals began before the online OA concept arrived. Nevertheless, these journals have provided access to back volumes as well for the benefit of the users. The study records journals that commenced in the years 1948, 1971, 1978 also have adopted online OA system eventually. There are 7 (4.27%) and 4 (2.44%) journals which instigated online OA to their content with difference between 1 to 5 years and 6 to 10 years from the year of establishment respectively (Table 5). 7 (4.27%) journals fall in the category of publication which started online OA after 20 years of journal's establishment. However, for 3 journals out of 5 ceased publications, year of OA provision could not be found due to merging of journal by the publishers and making their archives available under one URL.

**Table 5. Gap between first publication and online access**

| Years of Difference in OA Provision | No. of Journals | Percentage |
|---|---|---|
| From first volume | 135 | 82.32 |
| 1 to 5 Years | 7 | 4.27 |
| 6 to 10 Years | 4 | 2.44 |
| 11 to 20 years | 8 | 4.88 |
| More than 20 Years | 7 | 4.27 |
| Merged | 3 | 1.83 |

## 12. Model of Licensing

Copyright issues have been one of the serious concerns that are hindering the distribution of information without restrictions. Creative Commons (CC) license has ways to address this issue. It is a kind of public copyright license that facilitates the distribution of copyrighted work by which an author gives freedom to the users to use, share and build upon the work. There are many kinds of CC licenses and their conditions differ according to terms of distribution and use[9]. In the present study 141 (73.78%) journals have adopted CC licenses for predefined distribution and utility of content. A few (1.83%) journal publishers have adopted their own license for distribution of content and for 20 journals (12.20%) there found to be no information on license adoption. Among CC licenses, CC BY is most adopted (59.15%) license by OAJs. CC BY encourages commercial use with a credit to the original work whereas CC BY-NC-ND places more restrictions on downloading and sharing which is adopted by 19 (11.59%) journals. CC BY-NC (9.76%) permits non-commercial use alone if one wishes to build upon the original work (Figure 1). The rate of adoption of licensing models shows rising awareness of license among publishers while distributing content with OA concept.

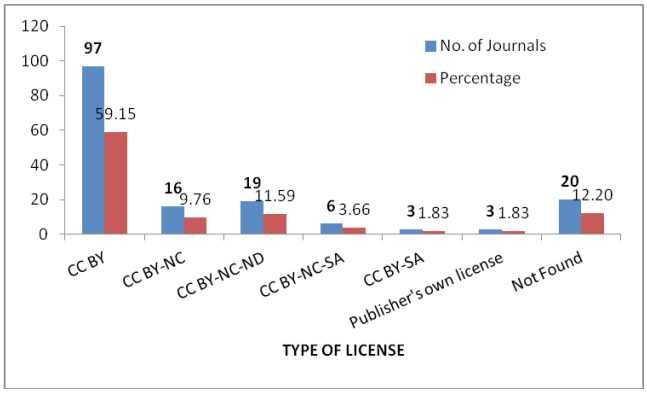


**Figure 1.** Models of licensing

## 13. Platform for Distribution

The information revolution has been so influential that management and distribution of information have reached new heights. OA movement, an exemplar of information revolution, is making mark in every possible activity of information. Chemistry OA journals are using Open Journal Systems (OJS), an open source and community driven platform for the distribution of content. In the present study, 15 (9.15%) journals were found to be using OJS for their content hosting while the rest (90.85%) are hosting on their own platforms. Commercial service providers are available for OJS using journals to host and maintain for the clients according to their requirements which can make hosting more professional and effective.

## 14. Formats

PDF has become the universally accepted format for providing academic and scholarly content online. Every journal in the study has provided its content in PDF. 56.10% of journals provide content in HTML and 21.95% journals provide content in XML formats. ePub being flexible to be downloaded on smart phones and tablets has been one of the formats of 18.29% journals for content distribution. In Figure 2, it can be observed that, 58.54% journals in the study provide articles in multi formats and 41.46% journals have made PDF as their only format of distribution.

## 15. APC and Waiver Policy

Out of 164 Chemistry OAJs, 107 (65.24%) journals charge Article Processing Fee/Open Access Fee to authors for their papers to be published. It is unquestionable that

OA journals are free of cost for usage but not fee of cost for production[10]. Some journals charge such fee towards publishing, maintenance, long term preservation of articles and distribution free of cost. 76 (46.34%) OA journals in Chemistry have provision in their waiver policy for Low-income economies, Lower-middle income economies as classified by the World Bank. Authors of listed countries may request for waiver which are processed at the time of publication. On subscription or membership of certain organizations and association with funding agencies are also being instrumental in waiving off the APC. Apart from APC, the maintenance cost of OAJs is taken care of by volunteers and institutional subsidies[11].

## 16. Warrant of Plagiarism

Plagiarism has been a crucial issue in the field of contemporary publication. Publishing new knowledge which is not duplicating something already published, but complementary to existing knowledge is an issue in research. Plagiarism detection in recent years has gained importance to maintain quality of research. Citing the reference extracted and thereby crediting the source author has become more meticulous due to developments in plagiarism detection. Research journals nowadays prioritize to check for plagiarism with authenticated plagiarism detection software. In the current study 116 (70.73%) journals have given information about their policy on plagiarism. Some publishers have mentioned the software that they use for plagiarism check. Turnitin, CrossRef and ithenticate are found to be used by most of the publishers.

## 17. Print V/s Online

The trend of providing journals both in print and online have been in practice and online publishing is growing in recent years to make the content instantly available to the user community. It is observed that 77 (46.95%) OAJs in Chemistry are still retaining the print version of the journals. Journals established in recent years are in digital version only which is often said to be the need of the age. Hybrid journals have subscription charges for print versions though the online version is OA. Journals of ceased publications (3.05%) were not considered for this segment as they are no more publishing articles

## 18. OAJs and Web 2.0

Adoption of Web 2.0 applications has added more value to information business. Specialized services such as article alerting service and association with social media applications bring more visibility. In the present study, 43 (26.22%) publishers have adopted Really Simple Syndication (RSS) for alerting addition of new articles to the journal. 86 (52.44%) OAJs in Chemistry have links to various social media applications such as Facebook, Twitter, LinkedIn and Delicious on their websites. Libraries of information age have found ways to deliver Current Awareness Service and Selective Dissemination of Information service in more effective and sophisticated manner and Web 2.0 in this direction is making mark by efficient syndication and promotion of new arrivals. The other branches of Web 2.0 such as social book marking, web content voting, blogging, tagging and wiki can be

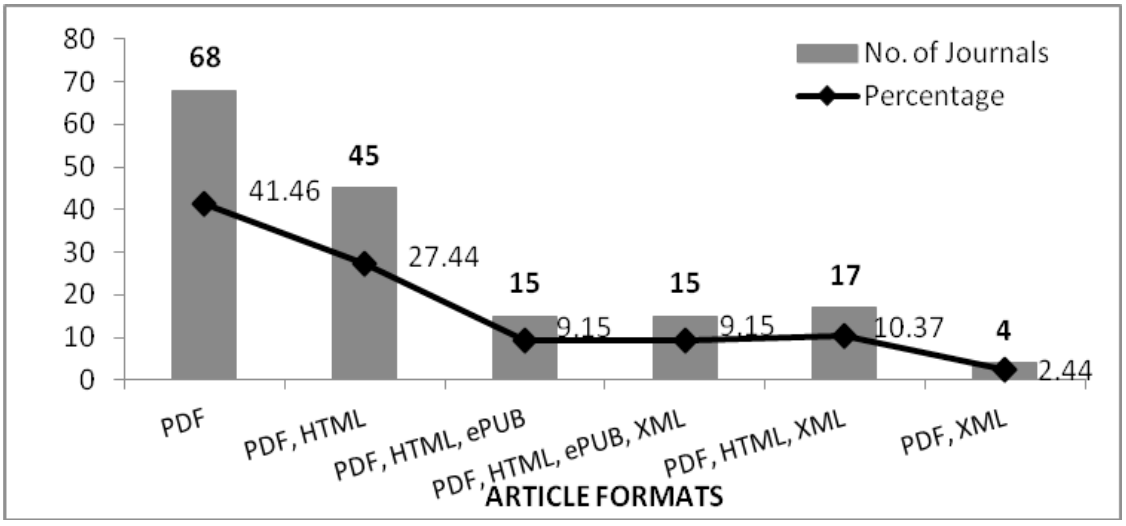


**Figure 2.** Formats of content distribution.

effectively used in OAJs to bring more accessibility which in turn help to improve the users experience[12].

## 19. Conclusion

The concepts of OA and 'information for all' go hand in hand. OA is getting increasing prominence. Accessibility to utility of scientific research has been enhanced due to OA movement. Growth of OAJs is promising with participation of developing countries. IF of OAJs indicates the need for self-evaluation to improve the quality to compete with commercial counterparts. Publishers of OAJs are incorporating Web 2.0 applications in the process of dissemination and expanding their prospect of delivering services which are redefined versions of conventional library services. With extensive use of Web 2.0, OA movement is expected to provide a novel framework for distribution of scholarly content. Journals' paradigm shift from print to online OA signifies the efficiency, ease and effectiveness in both preservation and distribution of electronic content. It is expected that more non-OAJs will be made OAJs in the years to come without compromising the quality.

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