



Research Article

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Analysis of scientific papers in the field of nuclides bioremediation included in the science citation index expanded from 2003 to June 2013

Liping Ruan

Library, Southwest University of Science and Technology, Mianyang, Sichuan, China

ABSTRACT

We aimed to analyze scientific papers in the field of bioremediation of nuclides included in the Science Citation Index Expanded and compared the number of published scientific papers from year 2003 to June 2013. Analyzed parameters included the total number of publications, document types, journals, and institutions. Overall, 711 papers were published in the field of nuclides bioremediation in 84 different SCIE journals, between 2003 and June, 2013, of which 663 (93.2%) were article-type papers. Of the total articles published in related journals, the journal with the highest number of articles was the Environmental Science Technology (n = 68, 9.5%). The institution which produced the highest number of publications was Pacific Northwest National Laboratory (n = 74, 10.4%). The number of scientific articles published in the field of nuclides bioremediation in SCIE journals has increased significantly over the past 10 years and will be reasonable to keep a promising increase in the future.

Keywords: Nuclides Bioremediation; Publications; Citation Analysis

INTRODUCTION

Number of scientific publications is an important reflection of scientific activity in a research field [1-3]. In recent years there has been a significant increase in the number of publications in the field of bioremediation of nuclides contamination. Science Citation IndexTM (SCI) was originally introduced in 1961 as a tool for bibliographical retrieval and provides a comprehensive database for analysis of journals and publications [4]. Web of Science is a software that can be used for analysis of scientific papers indexed in the Science Citation Index ExpandedTM according to various parameters. In this study, we aimed to analyze the scientific papers published in the journals from the field of bioremediation of nuclides contamination that were indexed in the Science Citation Index Expanded and compared the number of published scientific paper from different countries and years.

EXPERIMENTAL SECTION

ISI Web of Knowledge®-Web of Science® was used for analysis. We retrospectively searched all papers in the field of bioremediation of nuclides between 2003 and June, 2013 by using Web of Science software. Eighty four journals were found in the field of bioremediation of nuclides. We performed the analysis by typing "bioremediation" "nuclides contamination" in the address section using the general search function of the software. We further analyzed these results by using the "analyze" function of the software according to the number of publications per year, journals, authors, institutes and types of papers. We also calculated the total number of citations to published scientific papers. In software search, it is possible to scan maximum 50 journals at a time, therefore the analysis was completed separately as three groups and the results were assembled together as a final list.

RESULTS

Overall, 711 papers were published between 2003 and June 2013. Numbers of the publications increased dramatically from 2003 (n=34) to 2012 (n=95) and most of the publications were articles (Table 1, Fig. 1). The top 5 journals publishing papers in the field of bioremediation of nuclides were Environmental Science Technology (n=68), Applied and Environmental Microbiology (n=39), Journal of Environmental Radioactivity (n=34), Geochemical Et Cosmochimica Acta (n=20) and Geomicrobiology (n=20) (Table 2). The top 5 institutes from USA (Pacific Northwest National Laboratory, University of California, Berkeley, University of Massachusetts, Oak Ridge National Laboratory and Stanford University) make up over 40% of all publications in this field (Table 3). All published papers received 10,940 citations and citation to paper ratio was 15.39 (Fig. 2). The ranks of top 3 countries in terms of published papers are followed as USA, France and Germany (Table 4).

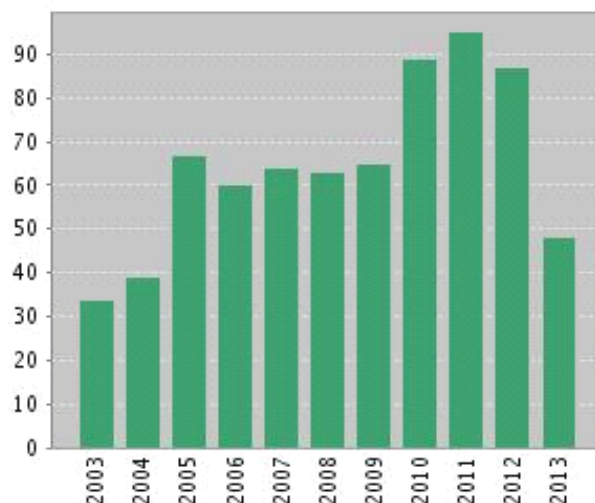


Fig.1 Publications originating from journals in the field of bioremediation of nuclides between 2003 and June 2013

Table 1. Distribution of types of articles in the field of bioremediation of nuclide between 2003 and June, 2013

Document type	Number	Percentage(%) of 711
Article	663	93.249
Book Chapter	3	0.422
Correction	2	0.281
Meeting Abstract	13	1.828
Proceedings Paper	45	6.329
Review	32	4.501

Table 2. Distribution of journals rank by the number of publication of bioremediation of nuclides between 2003 and June, 2013

Journal	Number	Percentage (%) of 711
ENVIRONMENTAL SCIENCE TECHNOLOGY	68	9.564
APPLIED AND ENVIRONMENTAL MICROBIOLOGY	39	5.485
JOURNAL OF ENVIRONMENTAL RADIOACTIVITY	34	4.782
GEOCHIMICA ET COSMOCHIMICA ACTA	20	2.813
GEOMICROBIOLOGY JOURNAL	20	2.813
JOURNAL OF RADIOANALYTICAL AND NUCLEAR CHEMISTRY	19	2.672
SCIENCE OF THE TOTAL ENVIRONMENT	18	2.532
JOURNAL OF HAZARDOUS MATERIALS	16	2.25
CHEMOSPHERE	15	2.11
ISME JOURNAL	13	1.828

Table 3 Distribution by countries published in journals in the field of bioremediation of nuclides between 2003 and June 2013.

Country	Number	Percentage (%)
USA	325	45.71
FRANCE	50	7.032
GERMANY	49	6.892
ENGLAND	43	6.048
INDIA	43	6.048
PEOPLES R CHINA	37	5.204
CANADA	33	4.641
SWITZERLAND	24	3.376
POLAND	23	3.235
PORTUGAL	21	2.954

DISCUSSION

Number of publications from the journals in the field of bioremediation of nuclides has increased significantly in recent 10 years and the driving force leading to increased publications in the field of bioremediation of nuclides appears to be the rapid adaptation to bioremediation technology and improved nuclides contamination issues. According to the facts, the United States remains the leader in productivity of nuclides research, and this includes their contribution to bioremediation of nuclides contamination[5-6]. However, its share of research articles in the field of nuclides bioremediation decreased from 52.3% between 2003 and 2007 to 44.6% between 2008 and 2013, although the absolute number of articles has slightly increased. It is considered that the researchers begin to draw more attention about the control of nuclides contamination, including the field of bioremediation, to some extent, because of the nuclides contamination accidents happened in Japan nuclear power plant [7].

Therefore, this study suggests that nuclides bioremediation research output is increasing drastic in recent 4 years worldwide. There are several possible reasons for this phenomenon. Firstly, the most important consideration is that absolute number of citations in all scientific fields has been rising recent years.

Secondly, such trends might indicate an increasing number of researchers in the world, as well as a continually growing need for scientists to publish. Moreover, there have more journals from environment and biology concerning on the field of the nuclide bioremediation. The rapid development of bioremediation technology such as microorganism remediation and phytoremediation and molecular biology can influence the increase in publications in the field of nuclides bioremediation [8-9].

Table 4. Distribution of institutions of articles in the field of bioremediation of nuclides between 2003 and June, 2013

Institution	Number	Percentage (%)
PACIFIC NW NATL LAB	74	10.408
UNIV CALIF BERKELEY	66	9.283
UNIV MASSACHUSETTS	56	7.876
OAK RIDGE NATL LAB	54	7.595
STANFORD UNIV	36	5.063
UNIV OKLAHOMA	25	3.516
GEORGIA INST TECHNOL	24	3.376
ARGONNE NATL LAB	22	3.094
UNIV TENNESSEE	20	2.813
BHABHA ATOM RES CTR	19	2.672

The fact that our study analyzed only journals in the field of nuclide bioremediation is a limitation. This can cause overestimation or underestimation of bioremediation scientific production. In addition, there are several limitations in the bibliometric data in this study. First, some studies were collaborative efforts conducted by mixed teams of domestic or international researchers. These articles may have inadvertently been accounted for by more than one institution or country, as the first author's or corresponding author' affiliation to the article was not included in the ISI Web of Knowledge database. Secondly, some articles written by related researchers might have been published in non-bioremediation or nuclide journals in order to receive high impact factors. Another handicap that we encountered during the study was the uncertainty of addresses of some researchers. Addresses from the same university, even from the same department, could be different. The standardization of the addresses carries importance. It may be hard to obtain articles published before 1980 as addresses are not always registered on online archives[10]. As the journal list is updated regularly, the numerical changes in the results should also be taken into consideration.

In conclusion, the number of scientific articles published in the field of nuclides bioremediation in SCIE journals has

increased significantly over the past 10 years and will be considered to keep increasing in the future.

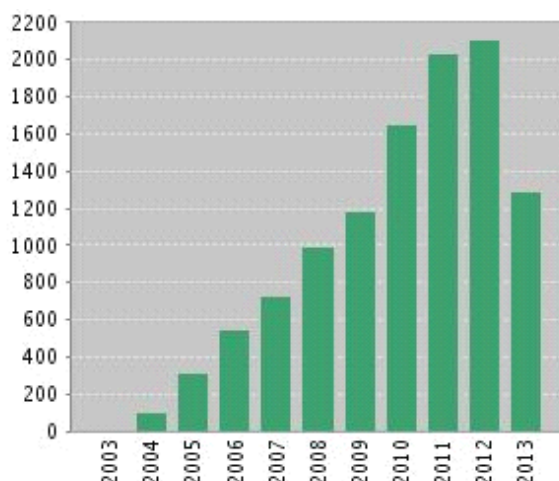


Figure 2. Citations in the journals to articles in the field of bioremediation of nuclides between 2003 and June, 2013

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