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DOI 10.1070/RC2007v076n08ABEH003744

Bibliometric analysis of the journal Uspekhi Khimii (Russian Chemical Reviews)

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Scientific journals, which first appeared in the second half of the 17th century (the oldest of the currently existing journals, Philosophical Transactions of the Royal Society, has been published since 1665),[1] made a great contribution to the formation and development of science. At that time, scientific journals did not publish review articles, as there was no need in them. However, the subsequent avalanche-like increase in the amount of primary scientific information made impossible 'tracing' of the necessary publications in the rapidly growing number of scientific periodicals. It became necessary to generalise the scientific knowledge either as monographs or as scientific reviews, which are much faster responding and available than monographs. In the early 20th century, special review journals were founded for publishing review articles. In chemistry, these journals were represented by Chemical Reviews, Accounts of Chemical Research, Chemical Society Reviews and so on; in the USSR, the Uspekhi Khimii (Russian Chemical Reviews) journal was created for this purpose.

Uspekhi Khimii was founded in 1932 by the decision of the USSR Narkompros (Ministry of Education) for publishing review papers in theoretical and experimental chemistry and chemical engineering that were of great methodological and integrating value. Currently, this is a leading periodical of the Russian Academy of Sciences concerned with chemistry and related sciences. In 2007, Uspekhi Khimii marked its 75th birthday. This is a serious age for a journal and a worthy occasion for its bibliometric analysis. The bibliometric (scientometric) methods[2] using statistical data on publications, references, citation and some other parameters have come in wide use in the second half of the 20th century to characterise the state-of-the-art and the trends in the development of science and to evaluate scientific journals. At present, bibliometric analysis of scientific journals has become routine practice for both foreign and Russian periodicals, including those dealing with chemistry.[3 – 10]

Modern bibliometric studies use most often databases (DB) of scientific and technical information as the source of primary data.[2, 11] Despite the fact that bibliometry is mainly a retrospective descriptive science, systematically described bibliometric data form the quantitative base for analysis. In some cases, this analysis reveals hidden features and trends of a particular field of research covered by the journal and allows one to formulate proposals for increasing the efficiency and professional image of the journal.

The bibliometric analysis of the journal Uspekhi Khimii over the 75-year period of existence was carried out using reliable global DB, *viz*., Chemical Abstracts (CA) and SCISearch (a version of the Science Citation Index, SCI), *i.e*., the International Scientific and Technical Network (STN International),[12] through which the journal is perceived by most of the world chemical community (the STN provides the access to the CA DB retrospect down to 1907[13] and the SCI DB, down to 1974[14]). The journal Uspekhi Khimii (Russian Chemical Reviews) is included in the core journals list of the authoritative international DB — CA and SCI. It has been abstracted in the CA database from the first issue of 1932; overal, this DB keeps records of 99% of the journal's original publications.

By the search date (February to March 2007), the CA DB has contained 4281 papers of Uspekhi Khimii where the publications of 1932 – 1998 (starting with the first published review 'New problems in the investigation of mineral raw materials' by Academician A E Fersman) were recorded based on the original Russian-language edition Uspekhi Khimii (USP), while the 1999 – 2006 publications were taken from the translated version Russian Chemical Reviews (RCR), which has been published since 1960. The SCI database was found to contain 2324 papers published in Uspekhi Khimii in 1973 – 2006.

The joint search through both CA DB and SCI DB resulted in 4403 non-identical publications of the journal for 1932 – 2006, which is about 90% of the total number of publications (the original and translated versions of a paper were regarded as one publication). The difference between the total number of publications in USP/RCR and their number included in the DBs is due to the fact that from the early years of existence (1932 – 1950) and up to 1980 the journal published not only submitted papers but also translations of the reviews and survey papers written by most prominent world scientists (J Bernal, L Hammett, C Ingold, K Kohlrausch, E Rutherford, E Schrödinger, G Seaborg and others), which were not abstracted by the DB producers. During the period from 1932 to 1942 the numbers of original and translated articles in the journal were almost equal. Apart from translated articles, the journal also published historical and biographical as well as information articles, in particular, those dealing with the activities of scientific laboratories and institutes of the USSR Academy of Sciences. Figure 1 *a* presents the year-by-year variation of the journal's original publications abstracted in the DB and Fig. 1 *b* shows the same plot for the whole set of journal's publications.

The CA and SCI databases have records of 4766 authors of the journal USP/RCR. The average number of authors per review is two; the average number of reviews per author is less than two. About 75% of authors had only one publication in Uspekhi Khimii.

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Received 6 June 2007
Uspekhi Khimii **76** (8) 747 – 751 (2007); translated by Z P Bobkova

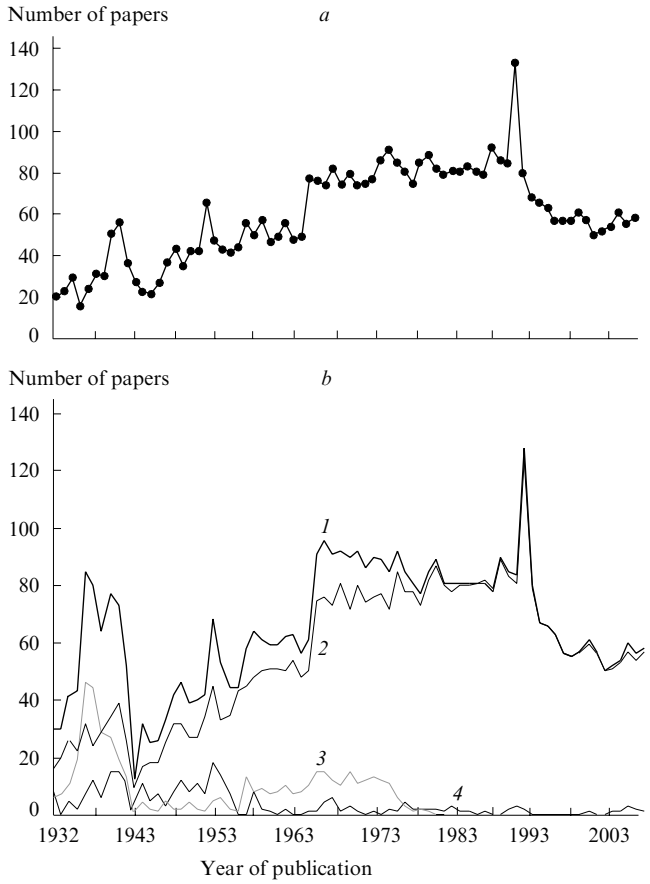


Figure 1. Year-by-year variation of the journal publications abstracted in the CA DB (*a*) and found by examining all journal issues (*b*).
(*1*) Total number of papers, (*2*) original reviews, (*3*) translated papers, (*4*) other.
The small difference between the curve shown in Fig. 1 *a* and curve *2* in Fig. 1 *b* is due to the fact that not all of the original papers published in Uspekhi Khimii were abstracted in the DB.

The authors' addresses kept in the DBs can be used to investigate their geographic and departmental distributions. The CA database cites the addresses for all authors. Table 1 summarises the institutions the employees of which appear most often in the journal (based on the data for 1978 – 2006), and Table 2 presents the departmental affiliations of the authors. It can be seen that the Academy of Sciences predominates among the departments and Moscow predominates among the cities.

Subject classification and controlled terminology of the CA DB allow one to characterise, although roughly, the main subject matter of journal publications. In the CA database, every abstract is placed in a particular subject section corresponding to the publication contents. The primary (1907) 30 sections were transformed in 1962 – 1967 into 80 subject sections, which were combined in 1974 into five gross categories: Biochemistry (BIO, sections 1 – 20), Organic chemistry (ORG, sections 21 – 34), Macromolecular chemistry (MAC, sections 35 – 46), Applied Chemistry and Chemical Engineering (APP, sections 47 – 64) and Physical, Inorganic and Analytical Chemistry (PIA, sections 65 – 80).[15]

The distributions of journal publications according to the CA DB subject sections and categories are presented in Fig. 2 (the publications of 1932 – 1966 were assigned to the currently existing categories taking into account the known prehistory of the sections[15]). These results indicate, in particular, that organic and physical chemistry prevail among branches of chemistry. Up to the mid-1960s, the attention has been focussed on the physical, inorganic and analytical chemistry, and in subsequent years, on organic chemistry (in the last decade, Uspekhi Khimii published many reviews on the chemical foundations of materials science). Since the mid-1960, the quantitative relations between the subjects distinguished in Fig. 2 for decade periods have been generally retained.

Analogous data for the journal Chemical Reviews[5] published by the American Chemical Society demonstrate that the majority of papers in this journal are also concerned with organic and physical chemistry. However, in recent years Chemical Reviews have published increasing number of reviews related to biological and biomedical sciences.[5]

The renown of any scientific journal is evaluated, among other factors, based on the amount of citation of papers

Table 1. Most productive scientific institutions in 1978 – 2006 (more than 25 reviews).

Institution	City	The number of papers in the DB	
		CA	SCI
A N Nesmeyanov Institute of Organo-element Compounds of the RAS	Moscow	169	164
M V Lomonosov Moscow State University	Moscow	165	158
N N Semenov Institute of Chemical Physics of the RAS	Moscow	138	133
N D Zelinsky Institute of Organic Chemistry of the RAS	Moscow	103	101
Institute of Problems of Chemical Physics of the RAS	Chernogolovka	79	75
Institute of Physical Chemistry of the RAS[a]	Moscow	54	54
G K Boreskov Institute of Catalysis, Siberian Branch of the RAS	Novosibirsk	46	39
Rostov State University	Rostov-on-Don	44	44
N I Lobachevskii Nozhnii Novgorod State University	Nizhnii Novgorod	39	34
St Petersburg State University	St Petersburg	39	42
A E Favorsky Irkutsk Institute of Chemistry, Siberian Branch of the RAS	Irkutsk	37	33
L Ya Karpov Institute of Physical Chemistry	Moscow	37	34
Kazan State University	Kazan	35	34
A V Topchiev Institute of Petrochemical Synthesis of the RAS	Moscow	31	24
D I Mendeleev University of Chemical Technology of Russia	Moscow	29	27
A N Frumkin Institute of Electrochemistry of the RAS[a]	Moscow	27	24

[a] Since 2006, A N Frumkin Institute of Physical Chemistry and Electrochemistry of the RAS.

Table 2. Department affiliations of journal authors.

Department	Database	
	CA	SCI
USSR Academy of Sciences/ Russian Academy of Sciences	1574	1096
Universities	1003	633
Research Institutes	379	142
Other	16	18

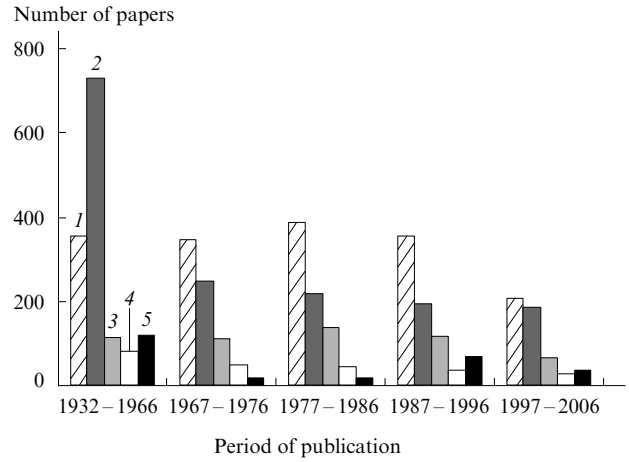


Figure 2. Distribution of Uspekhi Khimii (Russian Chemical Reviews) publications among the subject sections of the CA DB.
(*1*) ORG, (*2*) PIA, (*3*) MAC, (*4*) BIO, (*5*) APP.

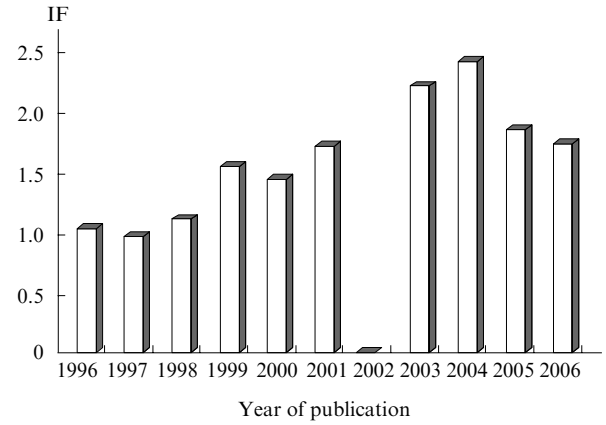


Figure 3. Impact factor of the journal Uspekhi Khimii for 1996 – 2006 (no data for 2002 are available).

published in this journal by other periodicals; this is reflected, in particular, by the impact factor (IF) of the journal. In terms of this parameter, Uspekhi Khimii has held the first or second position among all Russian scientific journals during the last 10 years. According to the Journal Citation Reports (JCR) DB, in 1996 – 2006 the impact factor of the journal varied from 0.983 (in 1997) to 2.392 (in 2004) (Fig. 3).[16, 17]

The citation search for the journal publications was carried out by two standard procedures:[6 – 10] (i) using special search terms created on the basis of journal publications found; (ii) using full and abbreviated names of original (USP) and translated (RCR) versions of the journal. According to the SCI DB, 4403 publications of the journal were cited 66 350 times in 1974 – 2006; the original version was cited 47 827 times, while the English-translated one (since 1960) was cited 18 523 times. According to the CA DB, 4403 publications of the journal were cited 22 857 times in 1996 – 2006; of these, the original version was cited 12 303 times, while the English-language one, 10 556 times. A comparison of the list of publications in USP/RCR with the obtained list of references to these publications revealed journal's papers not included in the DB and, hence, not found during the primary search. This is due to the facts that Uspekhi Khimii published translated reviews from other journals not covered by the DB and that the original papers references to which contained mistakes in the digital part (year, volume, the first page), precluding their unambiguous identification, were also missing from the DB. The subsequent discussion takes into account only unambiguously identified original publications in USP/RCR. As a result, the number of citations of these identified publications in the SCI DB in 1974 – 2006 amounted to 61 540, while that in the CA DB was 22 401. Table 3 presents 15 most cited journal publications in the period of 1993 – 2006 according to the SCI

Table 3. Most cited publications in Uspekhi Khimii (Russian Chemical Reviews) in 1993 – 2006.

The number of references in the database		Publication			
SCI	CA [a]	authors, title	year	volume	page
159	131	Yu V Zefirov, P M Zorky. New applications of van der Waals radii in chemistry	1995	64	415
116	128	V I Ovcharenko, R Z Sagdeev. Molecular ferromagnets	1999	68	345
108	77	V I Sokolov, I V Stankevich. The fullerenes — new allotropic forms of carbon: molecular and electronic structure, and chemical properties	1993	62	419
96	111	D V Konarev, R N Lyubovskaya. Donor – acceptor complexes and radical ionic salts based on fullerenes	1999	68	19
91	106	Yu V Pleskov. Syntheic diamond in electrochemistry	1999	68	381
89	73	A P Polishchuk, T V Timofeeva. Metal-containing liquid – crystal phases	1993	62	291
87	86	G I Koldobskii, V A Ostrovskii. Tetrazoles	1994	63	797
83	63	I V Kozhevnikov. Fine organic synthesis with the aid of heteropolycompounds	1993	62	473
83	86	V L Ermolaev, E B Sveshnikova. The application of luminescence-kinetic methods in the study of the formation of lanthanide ion complexes in solution	1994	63	905
71	63	O I Kolodiazhnyi. Methods of preparation of *C*-substituted phosphorus ylides and their application in organic synthesis	1997	66	225
70	75	I.Yu. Galaev. 'Smart' polymers in biotechnology and medicine	1995	64	471
64	58	R Sh Vartapetyan, A M Voloshchuk. The mechanism of the adsorption of water molecules on carbon adsorbents	1995	64	985
64	67	A Ya Sychev, V G Isak. Iron compounds and the mechanisms of the homogeneous catalysis of the activation of O_2, H_2O_2 and the oxidation of organic substrates	1995	64	1105
63	78	A F Pozharskii. Naphthalene 'proton sponges'	1998	67	1
55	66	A D Garnovskii, B I Kharisov, G Gojon-Zorrilla, D A Garnovskii. Direct synthesis of coordination compounds from zerovalent metals and organic ligands	1995	64	201

[a] The CA DB considers citations only since 1996.

Table 4. Most cited (more than 150 citations) publications of the journal of 1974 – 2006 (SCI DB).

Publication	The number of references in the SCI BD		
	version		USP + RCR
	USP	RCR	
I V Berezin, K Martinek, A K Yatsimirskii. Physicochemical foundations of micellar catalysis 1973, Vol. 42, P. 787	142	347	489
T A Masrtyukova, M I Kabachnik. The application of the Hammett equation with the constants σ^{pH} in the chemistry of organophosphorus compounds, 1969, Vol. 38, P. 795	232	40	272
E A Paukshtis, E N Yurchenko. Study of the acid – base properties of heterogeneous catalysts by infrared spectroscopy, 1983, Vol. 52, P. 242	178	89	267
Yu V Zefirov, P M Zorky. Van der Waals radii and their application in chemistry, 1989, Vol. 58, P. 421	205	36	241
I V Kozhevnikov. Advances in catalysis by heteropolyacids, 1987, Vol. 56, P. 811	80	158	238
V V Dunina, O A Zalevskaya, V P Potapov. General principles and characteristics of cyclopalladation reactions,1988, Vol. 57, P. 250	48	181	229
I V Kozhevnikov, K I Matveev. Heteropolyacids in catalysis, 1982, Vol. 51, P. 1075	81	96	177
M I Vinnik. Acidity functions of aqueous solutions of strong acids, 1966, Vol. 35, P. 802	167	6	173
M I Stankevich, I V Stankevich, N S Zefirov. Topological indices in organic chemistry, 1988, Vol. 57, P. 191	117	43	160
Yu V Zefirov, P M Zorky. New applications of van der Waals radii in chemistry, 1995, Vol. 64, P. 415	127	32	159
A L Buchachenko. Organic and molecular ferromagnetics: advances and problems, 1990, Vol. 59, P. 307	57	100	157

and CA DBs and Table 4 shows the most cited publications of the journal (more than 150 citations) for 1974 – 2006 (according to the SCI DB data) with indication of the journal version that is cited.

It can be seen from Table 3 that the numbers of citations according to the SCI DB and CA DB do not coincide, but nevertheless, they allow one to evaluate the popularity of a particular paper. (It should, however, be borne in mind that the amount of citation does not say anything about other features of the papers, *i.e.*, the originality and reliability, information value and the contribution to the scientific progress.[18]) It follows from Table 4 that both Russian- and English-language versions of the journal are cited. When comparing the citation data with data on downloading of full papers from the journal's Internet site (Table 5, statistical data from the journal's DB), one can see that the request rate for the electronic versions of the papers does not correlate with the citation rate. Note that of the 17 publications presented in Table 5, nine are related to nanomaterials.

Analysis of the citation dynamics makes sense for comparing rather long periods of time, for example, 10-year periods of publications and 12-year citation periods. Table 6 presents the citation data for these periods, which demonstrate that the number of citations of journal publications for corresponding 12-year periods was only 40% – 50% of the total number of citations by the search instant (the end of 2006). Thus it follows that the reviews published by Uspekhi Khimii (Russian Chemical Reviews) remain topical for long.

The reviews published in Uspekhi Khimii (Russian Chemical Reviews) are often cited by both Russian and foreign

Table 5. Statistical data on downloading of the electronic versions of papers from the Uspekhi Khimii (Russian Chemical Reviews) internet site for 1996 – 2006.

The number of down-loadings	Publication			
	authors, title	year	volume	page
203	T V Vernitskaya, O N Efimov. Polypyrrole: a conducting polymer; its synthesis, properties and applications	1997	66	443
108	A L Ivanovskii. Non-carbon nanotubes: synthesis and simulation	2002	71	175
105	G B Sergeev. Nanochemistry of metals	2001	70	809
104	A D Pomogailo. Hybrid polymer-inorganic nanocomposites	2000	69	53
102	S P Gubin, Yu A Koksharov, G B Khomutov, G Yu Yurkov Magnetic nanoparticles: preparation, structure and properties	2005	74	520
87	V A Tarasevich, N G Kozlov. Reductive amination of oxygen-containing organic compounds	1999	68	55
85	E G Rakov. Methods for preparation of carbon nanotubes	2000	69	35
83	R F Khairutdinov. Chemistry of semiconductor nanoparticles	1998	67	109
78	V V Rozanov, O V Krylov Hydrogen spillover in heterogeneous catalysis	1997	66	107
76	E G Rakov. The chemistry and application of carbon nanotubes	2001	70	827
66	E M Zubin, E A Romanova, T S Oretskaya. Modern methods for the synthesis of peptide – oligonucleotide conjugates	2002	71	239
65	V N Korotchenko, V G Nenajdenko, E S Balenkova, A V Shastin. Olefination of carbonyl compounds: modern and classical methods	2004	73	957
63	V I Roldugin. Self-assembly of nanoparticles at interfaces	2004	73	115
58	B V Timokhin, V A Baransky, G D Eliseeva. Levulinic acid in organic synthesis	1999	68	73
52	A D Pomogailo. Polymer-immobilised nanoscale and cluster metal particles	1997	66	679
51	L M Bronstein, S N Sidorov, P M Valetsky. Nanostructured polymeric systems as nanoreactors for nanoparticle formation	2004	73	501
50	N A Bragina, V V Chupin. Methods of synthesis of deuterium-labelled lipids	1997	66	975

Table 6. Citation of Uspekhi Khimii (Russian Chemical Reviews) according to periods (10-year publication periods and 12-year citation periods).

Database	Publication period	The number of publications	The number of citations	
			in 12 years (% of the total number of citations)	during 1975–2006
SCI	1975–1984	828	8862 (41)	21 615
	1985–1994	853	6780 (51)	13 214
SCI	1995–2004	568	7070	–
CA			7759	–

periodicals; according to the SCI DB, in the last decade (1996–2006), among the citing periodicals, about 48% are Russian journals and 52% are foreign journals. According to the CA DB, these values are 38% and 62%, respectively.

Table 7. Journals that cite most often papers from Uspekhi Khimii (Russian Chemical Reviews).

Journal	Database			
	SCI, references		CA, references	
	number	%	number	%
Russian Chemical Bulletin, International Edition (Izvestiya Akademii Nauk. Seriya Khimicheskaya)	379	6.1	345	5.8
Russian Journal of General Chemistry (Zhurnal Obshchei Khimii)	245	3.9	222	3.7
Russian Chemical Reviews (Uspekhi Khimii)	244	3.9	204	3.4
Russian Journal of Organic Chemistry (Zhurnal Organicheskoi Khimii)	217	3.5	199	3.4
Polymer Science (Vysokomolekulyarnye Soedineniya)	201	3.2	–	–
Russian Journal of Physical Chemistry (Zhurnal Fizicheskoi Khimii)	146	2.3	28	0.5
Russian Journal of Inorganic Chemistry (Zhurnal Neorganicheskoi Khimii)	144	2.3	–	–
Russian Journal of Applied Chemistry (Zhurnal Prikladnoi Khimii)	131	2.1	92	1.5
Kinetics and Catalysis (Kinetika i Kataliz)	118	1.9	106	1.8
Doklady of Chemistry (Doklady Akademii Nauk)	112	1.8	64	1.1
Tetrahedron	85	1.4	80	1.3
Journal of Organic Chemistry	72	1.2	76	1.3
Journal of the American Chemical Society	71	1.1	73	1.2
Phosphorus, Sulfur and Silicon and the Related Elements	64	1.0	51	0.9
Inorganic Chemistry	59	1.0	60	1.0
Synthesis	57	0.9	53	0.9
European Journal of Organic Chemistry	50	0.8	47	0.8
Journal of Organometallic Chemistry	45	0.7	47	0.8
Angewandte Chemie, International Edition	46	0.7	43	0.7
Journal of Applied Polymer Science	45	0.7	45	0.8
Chemical Reviews	39	0.6	37	0.6
Journal of Physical Chemistry A	39	0.6	38	0.6
Organometallics	38	0.6	38	0.6

Table 7 presents quantitative data on citation of reviews published by USP/RCR by Russian and foreign periodicals. The journal self-citation is low: from3.4% to 3.9%.

In conclusion, we would like to note that in recent years, owing to crucial changes in the editorial policy of the journal Uspekhi Khimii (Russian Chemical Reviews), transfer of the whole body of preparatory work for the edition of Russian- and English-language versions to the editorial office and recruiting highly skilled research personnel from the chemical institutes of the Russian Academy of Sciences for participation in editorial work, it became possible to increase the quality of selection of reviews and preparation for publication, to improve the appearance of the journal and attain almost simultaneous publication of the Russian and English versions.

The range ofthe journal authors and the staff of the Editorial Board headed by Academician O M Nefedov since 1995 were substantially extended; the international Advisory Board was founded. The journal started to practice the publication of invited reviews and subject-related issues devoted to topical trends of chemical science as well as the publication of special issues composed of reviews by leading scientists of particular centres of chemical science such as the Siberian Branch of the RAS, Moscow, St Petersburg and Kiev Universities, the Institute of Problems of Chemical Physics of the RAS and other.

Currently, both versions of the journal (Uspekhi Khimii and Russian Chemical Reviews) appear as both printed and electronic editions. Since 1995, the following information about the journal is available free on the Internet (http://www.uspkhim.ru): general information, subscription terms, the contents of the journal for a year and brief abstracts of all papers. In 2004, in cooperation with the British company Turpion Ltd (a partner in publishing English version of the journal), the electronic archive of the English version starting with the first issue (1960) was composed and an up-to-date integrated system for preparation, publication and distribution of the electronic version of the journal with the on-line submission and refereeing optios was elaborated. By now, the first stage of composing the electronic archive of the Russian version of the journal for 1990–2006 has been completed.

All this helps to maintain the subscribers' and readers' interest in the journal and to ensure its high rating.

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