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PERSPECTIVES

Nanoscience and nanotechnology in the Siberian Branch of the Russian Academy of Sciences: bibliometric analysis and evaluation

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Abstract The multidimensional bibliometric analysis of publications on nanoscience and nanotechnology (NS&NT) produced by the researchers of the Siberian Branch of the Russian Academy of Sciences (SB RAS) in 2007–2012 has shown their growing publication activity and international visibility in the field and the main objects of research such as nanoparticles, nanostructures (nanostructured materials), nanotubes (especially carbon ones), nanocomposites, nanocrystals, nanotechnology, and nanoelectronics and identified the most productive authors and institutes, as well as the most cited publications. It was made using the data from multidisciplinary (Web of Science, Scopus, and Russian Index of Scientific Citation) and specialized (Chemical Abstracts Plus and Inspec) information resources, that is from international (WoS, Scopus, CAPlus, and Inspec) and national (RISC) data bases. The analysis has shown that most of the SB RAS research works on NS&NT are concentrated in Novosibirsk Scientific Centre.

Keywords Bibliometric analysis · Databases · Information retrieval systems · Nanoscience · Nanotechnology · The Siberian Branch of the Russian Academy of Sciences

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Introduction

Nowadays, all developed countries pay considerable attention to the research in the field of nanoscience (NS) and nanotechnology (NT) owing to great innovative expectations. The achievements in this field are assumed to have a noticeable impact on all areas of production and social life of the world community (Andrievski and Klyuchareva 2011; Roco 2011). That is why the current state, the sophisticated structure, the fast dynamics, diverse trends, and exciting prospects of developing scientific and technological activities in the field of NS&NT require permanent real-time information monitoring and evaluation. The bibliometric analysis can serve as one of the most important tools.

Analysis and evaluation of national achievements in science and technology as well as their visibility in the global landscape have always been the most important targets of bibliometrics/scientometrics (e.g., Braun et al. 1995a, b), with special emphasis on selected research centers/institutions.

According to a general bibliometric analysis, the field of NS&NT is developing very fast—almost exponentially from the very beginning (Braun et al. 1997). Its multidisciplinary nature, a complex internal structure, and the increasing number of information sources (including patents) seriously complicate the NS&NT information search and make bibliometric analysis of its results a nontrivial task (Milojevic 2012; Porter and Youtie 2009; Zibareva et al. 2010). The results of such analysis depend strongly on the databases (DBs) and information retrieval systems (IRSs) used, as well as on criteria and methods for selecting relevant publications. The main problem here is to get the best possible coverage of the information flow. A separate use of multidisciplinary and specialized DBs and IRSs does not provide required coverage: firstly, due to the obviously limited number of treated information sources in case of multidisciplinary DBs and IRSs; secondly, due to the multidisciplinary nature of the field under investigation in case of specialized ones. One of the ways to solve the problem is the joint use of multidisciplinary and specialized information resources.

Thus, the rapid development of NS&NT results in an equally rapid aging of the obtained bibliometric data and is a reason for permanent bibliometric monitoring and evaluation of this field development in a certain country or center.

The DBs and IRSs most often used for NS&NT bibliometric analysis are: (1) SCI Expanded (Web of Science or WoS) and Essential Science Indicators (ESI) generated by Thomson Reuters; (2) Scopus by Elsevier; and (3) patent DBs, such as USPTO, EPO, and WIPO.

As mentioned above, all developed countries are involved in NS&NT research and development. The key actors, however, differ from one country to another depending on the national way organizing fundamental research works and its technological applications.

The organization of science in Russia is rather a specific one, since, historically the research has been concentrated mostly in the Russian Academy of Sciences (RAS), with universities and industrial companies playing a rather minor role. RAS (http://www.ras.ru/) is the leading national research organization and one of the world's biggest research structures that possesses recognized international visibility (SIR Global 2013—Rank: Output 2007–2011, http://www.scimagoir.com/). The RAS activities cover practically all natural, social, and human sciences, including NS&NT. Within RAS there are three regional branches, i.e., Ural, Siberian, and Far Eastern. The largest is the Siberian Branch (SB). It was founded in 1957, and now contains 79 research institutes situated in the Siberian Federal District of the Russian Federation (http://www.sbras.nsc.ru). The number of employees at SB RAS is about 29,000 including about 9500 scientists. With some important exceptions, key drivers of research work in SB RAS are mainly located in the Novosibirsk Scientific Centre (Markusova et al. 2012). In 2013, SB RAS received about RUR 17 billion for research and development from the Russian Federal Budget and an additional about RUR 7 billion came from contracts with foreign and domestic companies.

The development of NS&NT in Russia has already been analyzed by bibliometric methods (e.g., Markusova 2009; Reiss and Thielmann 2010; Shaburova 2012; Zibareva et al. 2010). The results revealed the important contribution of the RAS (Markusova 2009). At the same time, the role of its biggest regional branch, i.e., SB RAS remains largely unreported. The noticeable exceptions are recent studies on SB RAS activity based on the Inspec database, Russian Index of Scientific Citation (RISC), Chemical Abstracts Plus (CAPlus), and Scopus databases (Busygina 2009; Busygina et al. 2013; Shaburova et al. 2012; Shevchenko 2012; Zibareva and Elepov 2012). The results obtained have indicated that SB RAS makes a noteworthy contribution to the national development of NS&NT.

The aim of this work is in-depth bibliometric analysis and formal evaluation of SB RAS contribution to NS&NT based on its publication activity during 2007–2012.

Materials and methods

The distinctive feature of the information search methodology applied in this work is a joint use of multidisciplinary and specialized DBs as well as IRSs to achieve the maximum coverage of the relevant information flow. For this purpose, the multidisciplinary WoS, Scopus, RISC (Nano.elibrary.ru portal), and specialized CAPlus (SciFinder platform), the Inspec database (Ebsco platform) DBs and IRSs were used. They may be also characterized as international (WoS, Scopus, CAPlus, and the Inspec database) and national (RISC) information resources. The latter was used to cover nanopublications from Russian journals not treated in the above mentioned DBs.

To select the records a common methodology was applied: the affiliation of publications to SB RAS was detected by the authors' addresses given in the records. It should be noted that records of non-patent publications in CAPlus contain the address of the first author only, whereas those of patents give affiliations of all authors. In the Inspec database, addresses of all authors of a publication appeared in records only since 2008 (partly in 2007). For selecting publications on the NS&NT, a lexical query containing terms with the prefix *nano* was used. The retrieved documents with non-relevant terms such as nanoampere, nanosecond, nano2 (i.e., $NaNO_2$), nano3 (i.e., $NaNO_3$), etc., were excluded. Additionally, a lexical query containing ~200 non-*nano* terms relevant to NS&NT was employed (*cf.* Arora et al. 2013; Grieneisen and Zhang 2011; Huang et al. 2011; Maghrebi et al. 2011; Mogoutov and Kahane 2007).

Results and discussion

As mentioned above, the SB is the biggest regional unit of the RAS including 79 research institutes whose activities cover many fields of science and technology including NS&NT (http://www.sbras.nsc.ru). The search of SB RAS publications in this research field in the DBs mentioned for the period 2007–2012 was performed in July, 2013. The obtained initial publication sets were compared and publications discovered in only one resource, i.e., unique publications, were selected. It was found that during the period WoS presented 3377 publications of 69 SB RAS institutes, CAPlus—3192 (67 institutes), Scopus—2698 (67 institutes), Inspec—1883 (54 institutes). The biggest number of publications, 3920 (58 institutes) appeared in RISC. Overall, it was found that 69 SB RAS institutes are engaged in studying NS&NT, i.e., practically all institutes of the Branch, except for humanitarian ones. It was also found that each of the DBs mentioned has unique records—1096, 1436, 301, 574, and 1390, respectively. The largest amounts of unique publications were found in the CAPlus and RISC sets where their abundance was ~45 and 30 %, respectively. The highest number of publications, namely 3920, found in RISC, illustrates how important the use of national information resources is for bibliometric analysis of science in non-English speaking countries.

The publication dynamics during 2007–2012 is shown in Fig. 1.

Figure 1 reveals quite a monotonous growth of the SB RAS productivity in the field of NS&NT, except for the sharp maximum in 2011 according to the WoS, RISC and, especially, CAPlus. The nature of this phenomenon is not entirely clear since further statistics are incomplete. The right-hand decrease (2012) is supposed, at least in part, to be the result of just a slow processing of Russian publications in the DBs used including even the RISC. Indeed, when data on publications 2011 were harvested in 2012 and then a year later in 2013, the second amount was noticeably bigger than the first one, the effect was most prominent in the CAPlus and the Inspec databases. At the same time, it is unlikely that the decrease of productivity has a monocausal character especially under conditions of current management reorganization of science in Russia. In this context, the values at the right edge of Fig. 1 depend on the time of access to the resources and should be treated as *not less than*.

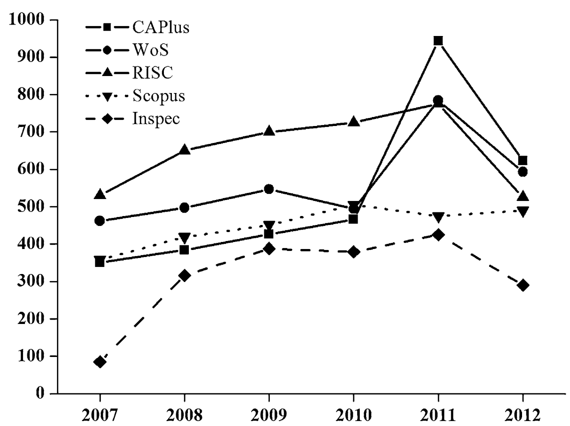

Fig. 1 Dynamics of the SB RAS publications on NS&NT during 2007–2012 as reflected in the DBs and IRSs used (July, 2013)

Table 1 SB RAS institutes most productive on NS&NT

Rank	Institute	Number of publications during 2007–2012				
		WoS	CAPlus	Scopus	Inspec	RISC
1	Rzhanov Institute of Semiconductor Physics (ISP), Novosibirsk	654	599	747	680	**749**
2	Boreskov Institute of Catalysis (BIC), Novosibirsk	609	476	504	180	**652**
3	Nikolaev Institute of Inorganic Chemistry (NIIC), Novosibirsk	**565**	485	352	196	413
4	Kirensky Institute of Physics (KIPh), Krasnoyarsk	302	287	236	180	**354**
5	Institute of Strength Physics and Materials Science (ISPMS), Tomsk	249	308	205	136	**390**
6	Institute of Solid State Chemistry and Mechanochemistry (ISSC MC), Novosibirsk	170	203	174	90	**233**
7	Voevodsky Institute of Chemical Kinetics and Combustion (ICKC), Novosibirsk	**111**	80	67	56	86
8	Melentiev Energy Systems Institute (ESI), Irkutsk	108	64	65	130	**136**
9	Kutateladze Institute of Thermophysics (IT), Novosibirsk	**102**	82	90	57	78
10	Khristianovich Institute of Theoretical and Applied Mechanics (ITAM), Novosibirsk	90	76	90	62	**132**

Official abbreviations are taken from the institutes' sites. The institutes are ranked according to WoS data. The best indicator for each institute is in bold

The main types of SB RAS publications on NS&NT are journal articles (from 3245 in WoS to 1706 in the Inspec database) with a noticeable number of reviews (~2 % in WoS and 4 % in CAPlus) and conference papers published in journals, conference proceedings, and as special issues in book series (from ~460 in Scopus to ~370 in WoS). In CAPlus, the only resource used that contained patents, the number of patents is only 3 % of the total number of journal articles. This fact indicates that in SB RAS, fundamental research on NS&NT dominates over applied research.

In all resources used, except for RISC, publications in English dominated. In WoS, there are 3339 articles in English and only 10 in Russian. In CAPlus, Scopus, Inspec, and RISC, this proportion is 2629/559, 2688/8, 1823/58, and 2033/2052, respectively. The interpretation may be as follows: the DBs contain records of publications from translated versions of Russian journals. Only in CAPlus ~560 publications in Russian were found. The quantitative superiority of publications in English shows the aim of SB RAS researchers to be involved in international scholarly activities and publications.

Data on the most productive SB RAS institutes, i.e., having more than 100 publications in one of the DBs used, are presented in Table 1.

It was discovered that the most productive SB RAS researchers are affiliated with NIIC, ISP, and BIC (the meaning of abbreviations is in Table 1) which are the leaders of SB RAS in this field. The top 5 are A. V. Okotrub (NIIC), V. I. Zaikovskii (BIC), L. G. Bulusheva (NIIC), V. P. Fedin (NIIC), and A. V. Dvurechenskii (ISP) having, respectively, 82, 77, 72, 72, and 54 publications in WoS, and 81, 78, 72, 27, and 65 publications in Scopus.

In SB RAS, studies on NS&NT were carried out in partnership with researchers from 51 (according to the WoS data) foreign countries. Among the leaders were Germany, the USA, France, Ukraine, and Spain. Among the foreign institutions, main partners are University of Sao Paulo, Brazil (29 and 22 joint publications according to WoS and Inspec, respectively), Chalmers University of Technology, Sweden (27 joint publications according to WoS), and University of the Basque Country, Spain (27 and 7 joint publications according to WoS and the Inspec, respectively). The SB RAS institutes widely cooperate with home organizations as well, most frequently with large universities in both Asian and European parts of the country, RAS institutes, and some other research organizations. The most important research partners are Novosibirsk State University, Siberian Federal University (Krasnoyarsk), Tomsk State University, and Moscow State University.

In WoS the term a *reprint author* identifies the leading author of a publication. The affiliation analysis

Table 2 Journals that most frequently published works of SB RAS on NS&NT in 2007–2012

Rank	Journals[a]	Number of publications				
		WoS	CAPlus	Scopus	Inspec	RISC
1	Journal of Structural Chemistry = Zhurnal Strukturnoi Khimii	123	**152**	60	34	57/75
2	Physical Review B: Condensed Matter and Materials Physics	78	38	70	**95**	78
3	JETP Letters = Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki	**87**	86	80	63	66/81
4	Kinetics and Catalysis = Kinetika i Kataliz	**87**	84	55	–	50/66
5	Physics of the Solid State = Fizika Tverdogo Tela	78	**80**	41	39	41/35
6	Semiconductors = Fizika i Tekhnika Poluprovodnikov	**72**	55	65	61	49/33
7	Technical Physics Letters = Pis'ma v Zhurnal Tekhnicheskoi Fiziki	**60**	46	44	27	38/36
8	Russian Physics Journal = Izvestiya VUZov. Fizika	57	34	35	37	21/**125**
9	Doklady (Chemistry, Physical Chemistry, etc.) = Doklady Akademii Nauk	43	**54**	42	11	41/33
10	Inorganic Materials = Neorganicheskie Materialy	43	**50**	36	39	31/31
11	Journal of Experimental and Theoretical Physics = Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki	39	45	30	22/1	**66**/32
12	Physical Mesomechanics = Fizicheskaya Mezomekhanika	34	**58**	26	–	38/60

[a] Shown are journals with more than 50 SB RAS publications on NS&NT in one of the DBs. The best indicator for each edition is in bold. The journals are ranked by WoS

of the researchers most often marked by the term a *reprint author* in the obtained records has shown that they work in the SB RAS institutes with ranks 1–3 in Table 1, i.e., ISP, NIIC, and BIC with 448, 352, and 321 publications, respectively. They are followed by KIP, ISPMS, ISSC MC having more than 100 publications each.

To analyze the main topics of SB RAS publications on NS&NT, two linguistic approaches were used. The first one was based on the subjects of journals that most frequently published works in this area (Table 2). The second one, on the publication themes which in different DBs are reflected by different linguistic means: (1) theme and subject headings, subject categories, classification codes, divisions, and rubrics; and (2) keywords (terms). Table 2 shows that the journals most frequently published works on NS&NT in 2007–2012 are English versions of Russian journals.

In different DBs and IRSs different terms are used to specify research and/or subject areas. The main research/subject terms of WoS, Scopus, and RISC do not reflect NS&NT directly. In WoS, the publications of SB RAS on NS&NT are indexed with the following subject areas (according to their rank): 1—physical chemistry, 2—materials science, 3—applied physics, 4—physics of condensed matter, 5—inorganic & nuclear chemistry, and only then 6—*nanoscience & nanotechnology*. It may be explained by the fact that subject areas reflecting the content of publications in this DB correlate with the subjects of journals, and at present the subject *Nanoscience & Nanotechnology* is attributed to a very limited number of journals (Zibareva and Elepov 2012).

More useful for specifying research and/or subject areas are thematic classifications and controlled terms (Tables 3, 4, 5 and 6). Specialized DBs have better linguistic means to reflect the content of publications. CAPlus has sections and headings (Table 3) and the Inspec database—sections and classification codes (Table 4). Both resources have controlled terminology (Tables 5 and 6). Contrary to divisions in multidisciplinary DBs, those in specialized ones reflect different fields of chemistry and physics that allows the understanding of what chemical and physical phenomena and/or processes are under investigation in this or that publication.

In CAPlus, thematic sections are combined in five broad headings: biochemistry (BIO), organic chemistry (ORG), applied chemistry (APP), physical, inorganic, and analytical chemistry (PIA), and macromolecular chemistry (MAC). The main sections assigned to SB RAS publications on NS&NT and their distribution over the headings are given in Table 3. The general distribution of SB RAS

Table 3 The distribution of SB RAS publications on NS&NT over headings and sections of CAPlus

Rank	Sections[a]	Heading	Number of publications
1	Electric phenomena	PIA	428
2	Optical, electron, and mass spectroscopy and other related properties	PIA	315
3	Nonferrous metals and alloys	APP	252
4	Ceramics	APP	241
5	Surface chemistry and colloids	PIA	178
6	Inorganic chemicals and reactions	PIA	176
7	Magnetic phenomena	PIA	137
8	Crystallography and liquid crystals	PIA	134
9	Ferrous metals and alloys	APP	118

[a] Shown are sections with more than 100 works

APP applied chemistry, PIA physical, inorganic, and analytical chemistry

Table 4 The distribution of SB RAS publications on NS&NT over the Inspec database classification codes

Rank	Classification codes[a]	Number of publications
1	A6146 Structure of solid clusters, nanoparticles, nanotubes and nanostructured materials	312
2	A8116[b] Methods of nanofabrication and processing	250
3	A6855 Thin film growth, structure, and epitaxy	223
4	A6865 Low-dimensional structures: growth, structure and nonelectronic properties	141
5	A6820 Solid surface structure	138
6	A7320D Electron states in low-dimensional structures	120
7	B2520D II-VI and III-V semiconductors	109

[a] Indicated are codes with more than 100 publications

[b] Including A8116D (self-assembly in nanofabrication, eight publications) and A8116 N (nanolithography, 6 publications)

publications on NS&NT over the headings is as follows: PIA—1643, APP—1010, ORG—147, MAC—127, and BIO—54 (the summations were done on the basis of sections while some of them belong to more than one heading).

The Inspec database has five main thematic divisions: A (physics), B (electrical engineering and electronics), C (computers and control), D (information technologies), and E (production technologies) which are divided in sections possessing classification codes. The general distribution of SB RAS publications on NS&NT over the Inspec divisions is as follows: A—1372, B—323, C—37, and E—67.

Overall, the main NS&NT objects and phenomena under investigation in SB RAS (within the controlled terms of the DBs used) are nanoparticles, nanostructures (nanostructured materials), nanotubes (especially carbon ones), nanocomposites, nanocrystals, NT, and nanoelectronics. This is in line with the global and Russian mainstream, the difference is in some priorities of subject areas between SB RAS, Russia, and the world.

The most cited publications on NS&NT affiliated with SB RAS are presented in Table 7. Noticeably, publications with ranks 26 and 27 were found only in RISC. It follows from this Table that the majority of these publications is co-authored with foreign researchers. This finding highlights once again the importance of cooperation in the field of NS&NT for SB RAS, as well as its successful involvement in such cooperation. The main motivations for the cooperation are the mutual interest to concrete ideas/objects and access to non-common/unique instrumentation available in partner countries. The cooperation results in international publications.

Table 5 The distribution of SB RAS publications on NS&NT over the controlled terms containing the prefix *nano* in CAPlus and the Inspec databases

Rank	Controlled terms[a]	Number of publications	
		CAPlus	Inspec
1	Nanoparticles	443	109
2	Nanostructures	166	9
3	Nanocomposites	141	42
4	Nanotubes	106	5
5	Nanocrystals	92	10
6	Nanostructured materials	66	52
7	Nanofibers	31	–
8	Nanocrystalline materials	16	–
9	Nanowires	11	8
10	Nanoporous materials	13	7
11	Nanofabrication	3	65
12	Nanoclusters	–	14

[a] Given are the terms assigned to at least ten publications in one of the DBs. The terms are ranked by CAPlus

Thematically, the publications are very diverse as can be deduced from the titles of the journals (Table 7). It is interesting to note that none of the journals contain the term *nano* in their titles. Meanwhile, according to Ulrich's Periodicals Directory, there were nearly 120 such journals during the studied period.

To characterize current visibility of SB RAS in global and Russian NS&NT landscapes, the WoS *Nanoscience & Nanotechnology* category (Table 8) was used for comparative analysis. It follows from Table 8 that during 2007–2012, Russia produced 2.45 % of the global amount of publications and 6.81 % of which were publications of SB RAS. According to CAPlus, for publications with controlled terms containing the prefix *nano* (Table 9, *cf.* Table 5) SB RAS shares ~0.4 % of world output on nanocrystals and nanostructures. On the Russian scale, SB RAS shares ~10 % of publications assigned to the every single *nano* term presented in Table 9. One can conclude that under current both international (global NS&NT boom) and national (insufficient research funds, negatively affecting scientific productivity, as well as general aging of research staff of RAS including SB RAS) circumstances, these scores are strong for SB RAS, especially taking into account the fact that only 3 of 69 institutes involved are the core ones in this context, and none of them is specialized exactly in NS&NT. In other words, though SB RAS is a large research organization, its international visibility in the

Table 6 The distribution of SB RAS publications on NS&NT over the controlled terms not containing the prefix *nano* in CAPlus and the Inspec databases

Rank	Controlled term[a]	Number of publications	
		CAPlus	Inspec
1	Microstructure	406	23
2	Crystal structure	341	32
3	Molecular structure	248	–
4	Surface structure	191	29
5	Annealing	155	102
6	Simulation and modeling	153	–
7	Electric conductivity	143	33
8	Oxidation	142	38
9	Films	133	5
10	Particle size	128	26
11	Raman spectra	128	51
12	Luminescence	127	4
13	Molecular beam epitaxy	117	48
14	Temperature	108	46
15	Phase composition	107	29
16	Powders	104	9
17	Electric current–potential relationship	103	–
18	Adsorption	102	48

[a] Given are the terms assigned to more than 100 publications in one of the DBs. The terms are ranked by CAPlus

Table 7 The most cited publications on NS&NT affiliated with SB RAS

Rank	Publication[a]	Citation score			
		WoS	CAPlus	Scopus	RISC
1.	Nair, R. R. (2010). Fluorographene: A two-dimensional counterpart of Teflon. *Small*, *6*(24), 2877–2884	263	**321**	270/ 313	263
2.	Maksimchuk, N. V. (2008). Heterogeneous selective oxidation catalysts based on coordination polymer MIL-101 and transition metal-substituted polyoxometalates. *Journal of Catalysis*, *257*(2), 315–323	116	115	**125**	109
3.	Maillard, F. J. (2007). CO monolayer oxidation on Pt nanoparticles: Further insights into the particle size effects. *Electroanalytical Chemistry*, *599*(2), 221–232	104	**121**	102	102
4.	Rossinyol, E. (2007). Synthesis and characterization of chromium-doped mesoporous tungsten oxide for gas-sensing applications. *Advanced Functional Materials*, *17*(11), 1801–1806	90	86	**95**	87
5.	Kuroda, K. (2010). Experimental realization of a three-dimensional topological insulator phase in ternary chalcogenide $TlBiSe_2$. *Physical Reviews Letters*, *105*(14), 146801	**81**	5	65	78
6.	Gerasko, O. A. (2008). Sandwich-type tetranuclear lanthanide complexes with cucurbit[6]uril: From molecular compounds to coordination polymers. *Inorganic Chemistry*, *47*(19), 8869–8880	72	**74**	71	63
7.	van de Loosdrecht, J. (2007). Cobalt Fischer–Tropsch synthesis: Deactivation by oxidation? *Catalysis Today*, *123*(1–4), 293–302	67	**77**	76	73
8.	Shenderova, O. (2007). Nanodiamond and onion-like carbon polymer nanocomposites. *Diamond and Related Materials*, *16*(4–7), 1213–1217	65	66	**70**	67
9.	Brun, C. (2009). Reduction of the superconducting gap of ultrathin Pb islands grown on Si(111). *Physical Review Letters*, *102*(20), 207002	**62**	3	51	51
10.	Anikeenko, A. V. (2007). Polytetrahedral nature of the dense disordered packings of hard spheres. *Physical Review Letters*, *98*(23), 235504	**60**	5	50	54
11.	Maksimchuk, N. V. (2010). Hybrid polyoxotungstate/MIL-101 materials: Synthesis, characterization, and catalysis of H_2O_2-based alkene epoxidation. *Inorganic Chemistry*, *49*(6), 2920–2930	58	61	**64**	52
12.	Lee, J. H. (2009). One-step exfoliation synthesis of easily soluble graphite and transparent conducting graphene sheets. *Advanced Materials*, *21*(43), 4383–4387	58	56	**66**	62
13.	Zhang, J. (2007). Effect of a dc electric field on the longitudinal resistance of two-dimensional electrons in a magnetic field. *Physical Review B*, *75*(8) 081305	**58**	12	52	46
14.	Bykov, A. A. (2007). Zero-differential resistance state of two-dimensional electron systems in strong magnetic fields. *Physical Review Letters*, *99*(11), 116801	61	2	59	**62**
15.	Knop-Gericke, A. (2009). X-Ray photoelectron spectroscopy for investigation of heterogeneous catalytic processes. *Advances in Catalysis*, *52*, 213–272	55	**63**	60	52
16.	Logvinova, A. M. (2008). Nanometre-sized mineral and fluid inclusions in cloudy Siberian diamonds: new insights on diamond formation. *European Journal of Mineralogy*, *20*(3), 317–331	55	33	54	**74**
17.	Palyanov, Y. N. (2007). The role of mantle ultrapotassic fluids in diamond formation. *Proceedings of the National Academy of Sciences of the USA*, *104*(22), 9122–9127	55	31	56	**58**
18.	Samsonenko, D. G. (2007). Microporous magnesium and manganese formates for acetylene storage and separation. *Chemistry – An Asian Journal*, *2*(4), 484–488	54	57	**66**	62
19.	Simakova, I. (2009). Deoxygenation of palmitic and stearic acid over supported Pd catalysts: Effect of metal dispersion. *Applied Catalysis A*, *355*(1–2), 100–108	53	55	**61**	58
20.	Gerasko, O. A. (2008). Tetranuclear lanthanide aqua hydroxo complexes with macrocyclic ligand cucurbit[6]uril. *European Journal of Inorganic Chemistry*, *2008*(3), 416–424	53	48	**55**	49
21.	Mikhaylov, G. (2011). Ferri-liposomes as an MRI-visible drug-delivery system for targeting tumors and their microenvironment. *Nature Nanotechnology*, *6*(8), 594–602	52	55	**60**	52

Table 7 continued

Rank	Publication[a]	Citation score			
		WoS	CAPlus	Scopus	RISC
22.	Puzyr, A. P. (2007). Nanodiamonds with novel properties: A biological study. *Diamond and Related Materials*, *16*(12), 2124–2128	50	47	57	**61**
23.	Gibson, N. (2009). Colloidal stability of modified nanodiamond particles *Diamond and Related Materials*, *18*(4), 620–626	46	49	54	**59**
24.	Vlassov, V. V. (2010). Circulating nucleic acids as a potential source for cancer biomarkers. *Current Molecular Medicine*, *10*(2), 142–165	42	37	51	**52**
25.	Koval, N. N. (2008). Nanostructuring of surfaces of metalloceramic and ceramic materials by electron beams. *Izvestiya Vysshikh Uchebnikh Zavedenii. Fizika*, *51*(5), 60–70	9	–	13	**80**
26.	Volkov, V. V. (2008). Membranes and Nanotechnology. *Rossiiskie Nanotekhnologii*, *3*(11–12), 67–101	–	–	–	**61**

Not less than 50 citations in one of the DBs on March 2014. Publications are ranked by the WoS

[a] Only the first author is given

Table 8 The number of global, Russian and SB RAS publications 2007–2012 on NS&NT assigned in WoS to *Nanoscience & Nanotechnology* category

Region	Number of publications		
	2007	2012	2007–2012
World	26,649	34,154	1,73,363
Russia	583	831	4246
SB RAS	34	60	289

Table 9 The distribution of global, Russian, and SB RAS publications 2007–2012 over the controlled terms containing the prefix *nano* in CAPlus

Controlled terms[a]	Number (%) of publications		
	World[b]	Russia	SB RAS
Nanoparticles	123103	4063 (3.30)	443 (0.36)
Nanostructures	42892	1860 (4.34)	166 (0.39)
Nanocomposites	41615	1458 (3.50)	141 (0.34)
Nanotubes	56787	1334 (2.35)	106 (0.19)
Nanocrystals	22685	858 (3.78)	92 (0.40)

[a] More than 90 publications of SB RAS assigned to

[b] 100 %

field of NS&NT thematically specified in Table 9 has been achieved by a very limited number of its institutes.

Conclusions and future work

Thus, in 2007–2012 the researchers affiliated with SB RAS published nearly four thousand works on NS&NT (WoS, CAPlus, RISC), among which there are about 25 articles that received more than 50 citations by March 2014 (Table 7) fixed at least in one of the resources used, i.e., considered to make fast and noticeable impact on the professional community. In general, during this period, the overall annual productivity of SB RAS researchers increased.

In 2007–2012, studies on NS&NT were carried out in practically all SB RAS research institutes, except for the humanitarian ones. They were performed in wide scientific cooperation with foreign and domestic organizations. The core of SB RAS institutes leading in NS&NT research includes Nikolaev Institute of Inorganic Chemistry (NIIC), Rzhanov Institute of Semiconductor Physics (ISP), and Boreskov Institute of Catalysis (BIC). Interestingly, none of these Institutes is specialized in NS&NT as such. This reflects interdisciplinary approach in this field accepted in SB RAS. Since all three institutes are located in the Novosibirsk Scientific Centre, the headquarters of SB RAS, this also highlights the concentration of most important research in a limited number of centers typical for Russia and some other countries (Markusova et al. 2012). The SB RAS researchers prominent in NS&NT are affiliated mostly with the aforementioned institutes. Ongoing restructuring of the RAS, initiated in 2013, does not cover investigated period 2007–2012 but may affect future activities of SB RAS in this field.

It is well known that the results of bibliometric analysis greatly depend on the information resources used. Non-Russian bibliographic DBs and IRSs, even with millions of records, do not cover Russian publications comprehensively (Zibareva and Soloshenko 2011). That is why their applicability to in-depth bibliometric study of Russian science is rather limited a priori. However, the national resource RISC does not reflect all publications of Russian scientists appearing in foreign information sources. That is why the values obtained in the present work are very important and rather unique.

In part, this situation is planned to be improved in a future work. The State Public Scientific and Technological Library of the SB RAS began creating its own *SB RAS Researchers' Publications on Nanostructures, Nanomaterials, and Nanotechnology Database*. The resource is aimed to reflect all SB RAS publications on NS&NT since 2000 (Busygina et al. 2010). The work is still in progress, however some preliminary results can already be reported. For example, the number of SB RAS publications on NS&NT collected in this DB for the period 2007–2012 is about 7750, i.e., far more than in any of the five resources used in this work. At the same time, international visibility and, especially, comparisons can be based only on commonly accepted international information resources.

In general, we can conclude that the SB RAS studies on NS&NT during 2007–2012 were quite productive and visible to international scientific community. Within Russia, the results presented may serve as an information base for decision making aimed at further progress of investigations in NS&NT.

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