

# ANALYSIS OF INIS, MSCl, INSPEC DATABASES CONCERNING THE DYNAMICS OF PUBLICATIONS ON LOW-ACTIVATED CHROMIUM ALLOYS FOR USE IN THE NUCLEAR AND FUSION POWER ENGINEERING

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The paper presents the results of scientometric analysis of data flows from the International Databases, over a period since 1971 to 2011, on low-activated chromium alloys suitable for operation under extremely hard conditions in nuclear and fusion reactors. A detailed analysis of three Databases makes it possible to obtain the data on temporal trends of publications and on contributions to them from different countries, as well as, to define the type of publications and their languages. It is shown that investigations and developments on low-activated chromium alloys are of current importance.

During the recent decades the global energy consumption used by all of human civilization has reached an enormous scale: at present time 7 billion people use more than 14 TWh. By projections, to 2050 the Earth's population will reach 9 billion and the world electricity demand will be doubled [1, 2]. As, unfortunately, most types of primary energy resources are fossil fuels (oil, coal, gas), on the one hand, the environment is polluted by greenhouse gases and ashes and, on the other hand, the depletion of these resources is approaching (in 100 years at the most).

Besides the renewable energy sources (solar energy, hydro- and wind power, biomass), the nuclear- and thermonuclear power will be used as a reliable and safe energy source. Actually, the making of nuclear and fusion reactors requires development of materials working under very hard conditions: intense neutron irradiation (about 200...250 dpa) and irradiation initiated by hydrogen ion flows (about 4400 appm per year) and helium ion flows (to 3500 appm per year), the dose build rate being of about 40 dpa/per year. Moreover, severe operating conditions are determined by sharp temperature variations, high mechanical stresses, (including pulsed one), corrosion attack etc. Note that in the prospective commercial reactors the neutron irradiation can reach a level of 400 dpa, and the irradiation initiated by hydrogen flow generation can be 20000 appm (for helium 6000 appm) [3].

It is commonly recognized that the materials satisfying all the requirements are: oxide dispersion-hardened steel (ODS), SiC/SiC composites, tungsten and chromium alloys. The characteristic features of the above-mentioned materials is a low induced radioactivity (that is important for their waste disposal and reprocessing), as well as, a high radiation resistance and perfect mechanical properties.

Previously, we have carried out the scientometric analysis of data flows on SiC/SiC [4], tungsten [5] and dispersion-hardened steel [6]. The present paper is aimed to the analysis of data flows on the suitable V-Cr-Ti alloy using three specialized International Databases: Materials Science Citation Index (MSCI since 1991 to

2011), International Nuclear Information System (INIS since 1971), and Information Service for Physics, Electronics and Computing (INSPEC since 1969). The first (MSCI), which has been established by the USA Institute for Scientific Information, performed abstracting of 500 world materials science journals, the second (INIS) is composed by common efforts of all 158 IAEA member-states, the third (INSPEC) is composed by the British Institute of Engineering and Technology and accomplish abstracting of 3500 world journals.

The results of automated retrieval of information documents on low-activated vanadium alloys in each of above-mentioned International Databases are given in Fig. 1.

One can see that the total number of publications in the Databases under consideration is approximately 80...110 papers with a sharp increase since 1995.

Distribution of information documents by main directions of investigations into the low-activated chromium alloys is presented in Table for each of Database being investigated.

Fig. 2 presents the countries the scientists of which carry out investigations and developments on low-activated chromium alloys.

Among the Databases under consideration the leaders are Japan, the USA and Russia.

Besides publications of scientists, taking part in investigations and developments under review, from the countries indicated in Fig. 2,a, the MSCI Database includes the publications of scientists from Turkey, Spain, S.Korea, India, Netherlands, Switzerland and Belgium (in order of publication decrease).

	MSCI	INIS	INSPEC
Irradiation effect	23.6%	22.9%	28.0%
Activation and transmutation	23.6%	18.1%	17.3%
Investigation of properties	23.6%	12.0%	18.7%
Production techniques	18.2%	33.7%	16.0%

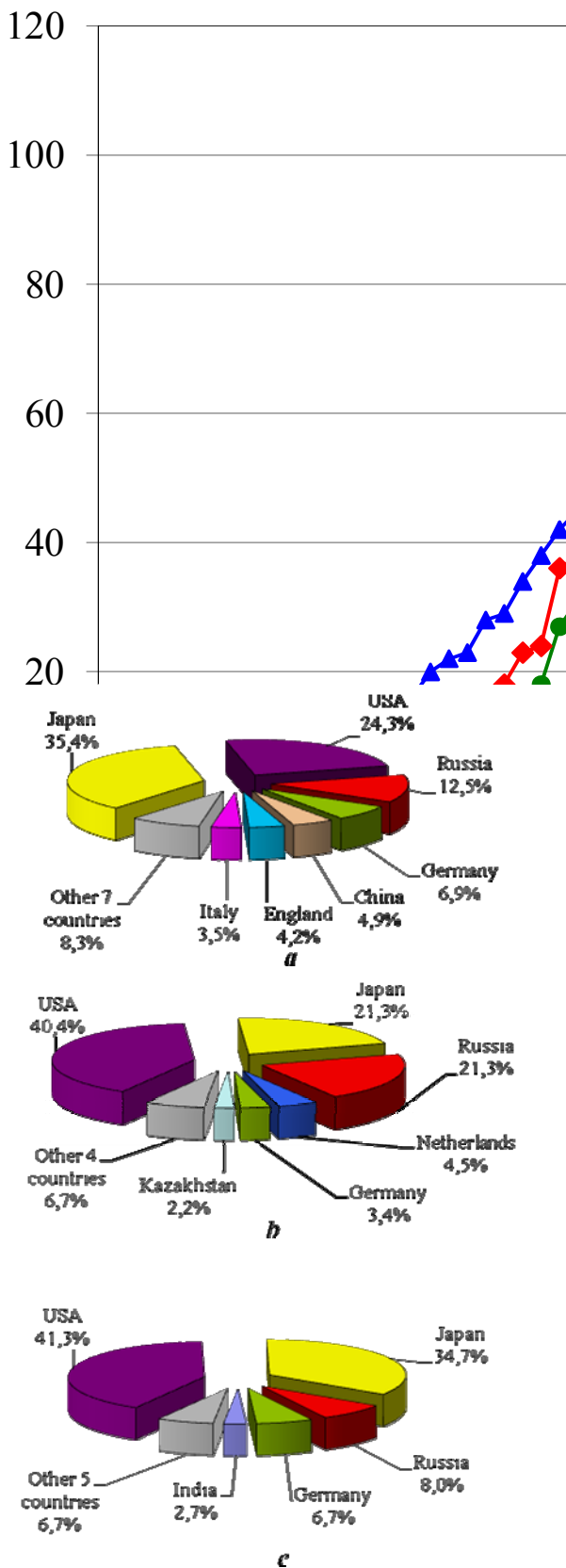


Fig. 2. Distribution of different countries' publications on chromium alloy data:  
 a – MSCI; b – INIS; c – INSPEC

The INIS Database comprises, besides publications from the countries indicated in Fig. 2,b, the publications of scientists from China, Italy, Great Britain and Ukraine.

The INSPEC Database comprises, besides publications of scientists from the countries indicated in Fig. 2,c, the publications of scientists from China, Italy, Turkey, Belgium and Portugal.

Fig. 3 presents the data on information sources introduced into the corresponding Databases.

In the MSCI database a main type of publications (see Fig. 3) are the conference proceedings (~ 58%), the journal articles take the second place (40%).

In the INIS database the conference proceedings are dominating (~ 53%) and the journal articles make approximately 29%.

The INSPEC database comprises ~ 49% of journal articles and ~ 48% of proceedings.

A prevailing language in all the Databases under review, as is seen from Fig. 4, is English (MSCI ~ 96%, INIS ~ 77%, INSPEC ~ 99%).

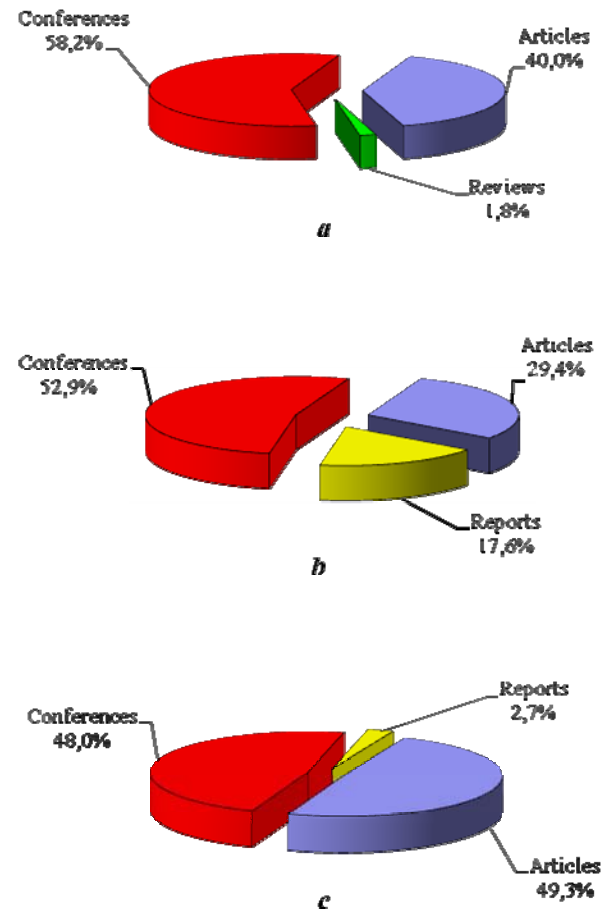


Fig. 3. Distribution of data sources by the type of publications: a – MSCI; b – INIS; c – INSPEC

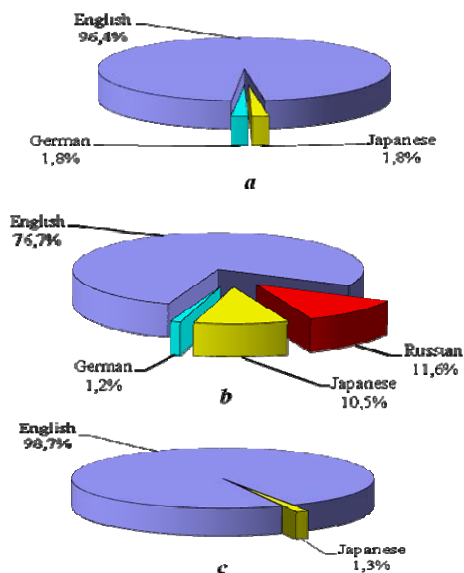


Fig. 4. Languages of publications on chromium alloys: a – MSCI; b – INIS; c – INSPEC

## CONCLUSIONS

The fact that investigation and development results on low-activated chromium alloys are published in many conference proceedings, and that the scientists of 17 countries, including advanced countries, participate in these investigations and developments, undoubtedly, evidences on the urgency of the subject under consideration. This conclusion is confirmed by the increase of publications since 1995. One can expect that such a tendency is still in progress as the increase of the resistance to radiation damage of future reactor materials and operating temperature rise should increase the efficiency of power reactor facilities. It is concerned with the increasing number of problems for corresponding investigations into mechanical properties, temperature, stresses

and irradiation effects, corrosion attack (see, for example, [7]).

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## АНАЛИЗ БАЗ ДАННЫХ INIS, MSCI, INSPEC ОТНОСИТЕЛЬНО ДИНАМИКИ ПУБЛИКАЦИЙ ПО МАЛОАКТИВИРУЕМЫМ СПЛАВАМ ХРОМА ДЛЯ ИСПОЛЬЗОВАНИЯ В ЯДЕРНОЙ И ТЕРМОЯДЕРНОЙ ЭНЕРГЕТИКЕ

А.Г. Шепелев, Ю.П. Курило, О.В. Кривченко, О.В. Немашкало

Обсуждаются результаты наукометрического анализа информационных потоков в Международных базах данных с 1971 по 2011 гг. по малоактивируемым сплавам хрома, которые применялись для крайне тяжелых условий работы ядерных и термоядерных реакторов. Подробный анализ трех указанных автоматизированных Баз данных дал возможность получить данные о временной динамике публикаций, а также о вкладе в них конкретных стран; определены типы публикаций и их языки. Показано, что исследования и разработки малоактивируемых сплавов хрома являются актуальными.

## АНАЛІЗ БАЗ ДАНИХ INIS, MSCI, INSPEC ВІДНОСНО ДИНАМІКИ ПУБЛІКАЦІЙ ПО МАЛОАКТИВОВАНИМ СПЛАВАМ ХРОМУ ДЛЯ ВИКОРИСТАННЯ В ЯДЕРНІЙ ТА ТЕРМОЯДЕРНІЙ ЕНЕРГЕТИЦІ

А.Г. Шепелев, Ю.П. Курило, О.В. Кривченко, О.В. Немашкало

Обговорюються результати наукометричного аналізу інформаційних потоків у Міжнародних базах даних з 1971 по 2011 рр. по малоактивованим сплавам хрому, придатних для край важких умов роботи ядерних і термоядерних реакторів. Докладний аналіз трьох зазначених автоматизованих Баз даних дав можливість отримати дані про динаміку публікацій в часі, а також про внесок у них конкретних країн; визначено типи публікацій і їхні мови. Показано, що дослідження і розробки малоактивованих сплавів хрому є актуальними.