

New Materials and Sustainable Development



The Advisory Board of the journal "Chemistry for Sustainable Development" complies with the request of the Organizing Committee of the Workshop of Asia Pacific Academy of Materials (APAM) to publish a special issue dedicated to the Workshop. As one of the organizers and participants of the Workshop, I would like to introduce the readers to the history of APAM and the major principles on which its activities are based.

The concept of sustainable development put forward by the United Nations Organization has won wide recognition in the world. Among unquestionable achievements is the acceptance of the principles of this Programme by a number of countries, the performance of high-level conferences in Rio de Janeiro and Kyoto, establishment of some workgroups. The society gets accustomed to the words "sustainable development", they are more and more frequently used by journalists and politicians. However, in order to bring this concept into reality, actions are required that would help solving the main problem, namely, the transition to life style and the manner of economics management which provide the balance of high life standards with careful use of world resources, conservation and improvement of the environment.

It is evident that the most important condition of sustainable development is the elaboration of diverse technologies that, either separately or together, meet the demands of the concept.

Among these technologies a key part is played by materials technologies including methods of materials design and production, as well as the processing of worked-out materials

and hardware made of them. Some problems of the materials science and technology connected with the concept of sustainable development are listed below:

- selection or design of a material that would better provide the required function;
- development of the methods to synthesize the materials with required properties providing minimization of the consumption of initial compounds and energy, as well as the yield of waste products;
- the search for efficient methods to process the used materials providing utilization of all the components;
- the development of methods to monitor exhausts of any kind (compounds, heat, radiation) and to neutralize them completely by means of utilization of wastes or burying them.

It is necessary to solve the listed problems both for the sake of the environment protection and for the construction and production of materials providing high life quality and used for the production of things necessary for human beings (clothes, homes, vehicles, communication means, equipment for leisure).

Important discoveries in materials science always led to substantial changes in human life

over the whole history of mankind. The 20th century is not an exception. All the most important technological achievements are connected with the discoveries and progress in materials technology. The role of materials science in the progress of technology and society has been recognized both in the developed countries and in developing ones. This is depicted in priorities that are put forward by the governments and scientific communities.

From the viewpoint of the importance of materials science and technology, the most striking example is the history of the Asian countries in the second half of the 20th century. The progress of Japan, South Korea, Taiwan, and later new "Asian tigers" (Singapore, Thailand, Hong Kong, Malaysia) is caused mainly by the development of industrial production of goods and products based on the use of new materials (polymers, construction and functional materials). A clever use of European and American developments at the first stage followed by the progress in the own potential in materials science and technology is the basis of rapid development of Asian countries.

The use of novel materials in the countries of Asia-Pacific region has well fallen within ancient technological traditions of these countries. The production of metals, ceramics, paper, stone processing, and other important technologies originated from Asian countries. By adding polymers, semiconductor and optical materials to the existing technological potential, the Asian countries are now leaders in the production of many kinds of the most important modern hardware. Materials science remains to be connected with the future of Asia. It is important that cooperation is an increasing tendency in this region. We come across the increasing understanding of the fact that the stability in the world requires equalization of the potentials of different regions. This is one of the major features of the concept of sustainable development finding its way into reality through strengthening links between Asian specialists in the field of materials science and technology.

Substantial and reliable basis exist for the Asian cooperation in materials science and technology. Advanced scientific schools are active in Russia, India, China, Japan. Much effort is aimed at the development in this direction in

the Republic of Korea, Singapore, Australia and other countries of the region. Materials societies have been established in many Asian countries. These societies not only unite the specialists of a country but also help enhancing international collaboration.

The idea to establish an organization that would provide permanent development of cooperation in this field in the Asia-Pacific region has been discussed for a long time. At the first stage the workgroup aimed at the creation of such an organization included specialists from Russia, Japan and Uzbekistan. Later China and Korea joined the workgroup. Finally, in April, 1992, the meeting of the Asia Pacific Society for Advanced Materials (APSAM) was held in Shanghai (Chinese Peoples' Republic). The Constitution adopted at the meeting proclaims that the goal of the Society is to promote scientific and technological potential of the countries of this region in the area of development and application of advanced materials. The Constitution makes a special stress on establishing efficient collaboration between scientific, educational and industrial organizations of the countries of Asia-Pacific region aimed at achieving the highest level in the development and application of materials, in order to increase life quality on the basis of wide use of advanced materials. APSAM incorporated India, China, Russia, Taiwan, Uzbekistan, South Korea, and Japan. Prof. J.-I. Nishizawa, a recognized specialist in the physics and technology of semiconductors, was elected President of the APSAM. The Society existed till December, 1996 when it was decided, at the APSAM General Assembly in Bangalore, December 9–14, 1996, to rearrange the Society into the Academy with individual membership. The last General Assembly of APSAM was held in June, 1997 in Shenyang (Chinese Peoples' Republic). This was at the same time the constituent meeting of the Asia Pacific Academy of Materials (APAM). Members recommended by the participating countries were elected. The members of the Executive Committee of the Asia Pacific Society for Advanced Materials received the status of members-founders of the Academy. Prof. J.-I. Nishizawa received a special status of the President-Founder of APAM. A famous Indian specialist in materials science, Prof. C. N. R. Rao was elected President

Date	Meeting	Town, country	Coordinator
April 26–30, 1992	Constituent meeting. Establishment of Asia Pacific Society for Advanced Materials (APSAM) Science session of APSAM	Shanghai, China	Prof. Zou Shichang
August 16–20, 1993	Annual meeting of APSAM General Assembly and science conference "Materials problems of clean energy production, creation of large scale integrated energy system". "Recent trend in advanced materials oriented industries in relation to economical and political changes in Russia and other countries of the region"	Novosibirsk, Russia	Prof. F. A. Kuznetsov
September 25–30, 1994	General Assembly and science conference "New perspective materials" Joint meeting of APSAM and Academy of Central Asia (ACA) "On the problems of technological exchange in Asia-Pacific region"	Tashkent, Uzbekistan	Prof. P. K. Khabibullayev
December 9–14, 1996	General Assembly and science conference "Energy Related Materials" Joint meeting of APSAM and MRS-India	Bangalore, India	Prof. C. N. R. Rao
June 23–26, 1997	General Assembly of APSAM Constituent meeting Asia Pacific Academy of Materials (APAM) and science conference "Materials Science Problems"	Shenyang, China	Prof. Qiao Guiwen
May 12–15, 1998	First topical seminar of APAM "Technology control methods and equipment for high pure substances and surface treatment, clean room, technology and technique"	Moscow, Russia	Prof. Yu. I. Tychkov
December 18–19, 1998	Second topical seminar of APAM "Asian priorities in materials development"	Taiwan	Prof. H. L. Hwang

of APAM. To emphasize the succession of goals and special importance of the links of scientific research with teaching and industrial production, the meeting adopted an emblem depicting this triad. Among the members of APAM there are 31 representatives of Japan, 40 of India, 40 of China, 37 of South Korea, 42 of Russia, 20 of Taiwan, and 4 of Uzbekistan. A complete list of meetings that have been held since the foundation of APSAM is presented in the Table.

The newest workshop took place in Novosibirsk. It gathered 153 participants. The following topics were included in consideration.

1. Intercalation and cluster compounds.
2. Novel methods of the investigation of materials properties.
3. Carbon materials.
4. Boron and silicon compounds.
5. Different materials.

Plenary sessions included the lectures delivered by Prof. C. N. R. Rao, the President of APAM, and by Prof. J.-I. Nishizawa, President-Founder of APAM. A "round table" was

held within the scope of the workshop. The participants of this session presented the developments and projects performed by the institutes of the Siberian Branch of the Russian Academy of Sciences. The session finished with press conference of APAM leaders.

As the list of topics shows, workgroups presented at the meeting deal with promising new materials, first of all functional and construction ones. Generally speaking, though the communications included in the programme do not embrace the whole range of materials developed and investigated in Asian countries, these communications demonstrate one of the main goals of APAM which is to promote contacts between specialists working on different aspects of materials science: search for new compounds and initial substances for the production of materials, improvement of synthesis processes, development of the means to test the properties of materials, and establishment of industrial production.

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