NANO@ir

Iran Nanotechnology Initiative Council Quarterly
Vol.2 No.1 October 2009

Global Nanotechnology

Top Iranian Products

Iran Nanotechnology Exhibition

NANO@ir

Published by:
Iran Nanotechnology Initiative Council (INIC)
P.O.Box: 14565-344
Tehran, Iran
Tel: +98 21 610020
Fax: +98 21 61002222
Email: ini@nano.ir
Web: en.nano.ir

International Cooperation

Based on its 20-year strategy plan, Iran has placed International Relations as a priority for its technological cooperation. This also is the main object of the NANO@ir quarterly newsletter. Through this newsletter, Iran aims to showcase its capabilities in the field of nanotechnology to the global nanotechnology community.

The first issue of the newsletter achieved some success in reaching that goal. Many letters were received from different countries and companies regarding the existing and potential opportunities for cooperation between Iranian institutes and foreign companies. Although this second issue is appearing relatively late, the publishers hope that it will receive a similar welcome, and promise it will appear regularly from now on.

Last year was quite a fruitful and active one for Iranian nanotechnology.

The first Iran Nanotechnology Festival, held in October, was warmly received by Iranian institutes, students, researchers and companies who convinced the organizers that next year's festival should include foreign participants as well.

Iranian companies and institutes also participated in three international exhibitions last year: Japan Nano tech, RUSNANOTECH and NanoEurope (held in Switzerland). A brief report of these events is included below.

An MoU was signed between Iran and India for joint projects in the field of nanotechnology, and a nanotechnology network between all the member countries of ECO (Economic Cooperation Organization) called ECONANO was approved, with the aim of creating large scale cooperation in the region.

An international workshop on nanotechnology called "Present Status and Future Prospects in Developing Countries" was also held in Iran during 18-20 May 2009, with the participation of member countries of NAM (Non-Aligned Movement).

Finally, we hope this quarterly newsletter will succeed in better acquainting its readers with Iran's nanotechnology potential, and all the comments we receive will surely help us to do so.

Iran Nanotechnology Festival - Displaying Success

The first Iranian Nanotechnology Festival was held in Tehran in October 2008. Based on the competencies of Iranian researchers, the main goals of the festival were to:

- Present the capabilities of Iran in the field of nanotechnology
- Display Iran-made nano-products
- Promote the commercialization of nanotechnology
- Hold an annual Nano-Awards Ceremony

The presence of thousands of investors, industrialists, directors, researchers and students, and their satisfaction with the trade fair on one side, and the direct interaction between students and ordinary people and administrators on the other side demonstrated the success of the exhibition in achieving the above goals.

About 130 nanotechnology-related research centers, universities and companies participated in the exhibition; the majority of the booths were rented by nano companies, which revealed the increasing interest in nano-products and their commercialization.

A booth called «Public Show», dedicated to presenting the general public with a basic definition of nanotechnology and its use in everyday life, was mounted in the festival besides the specialized pavilions. The active presence of students and their strong interest in this field indicated a bright future for nanotechnology in Iran. At the festival, the general public also showed a considerable fascination with nanotechnology and its products.

There were three workshops in conjunction with the main event, including:

- An international convention, attended by technology specialists and directors from different countries such as the United States, Great Britain, South Korea, Thailand and Malaysia;
- A meeting between top executives from nano companies, chief technical officers and businessmen active in the field of nanotechnology;
- A meeting of the directors of Iran Nano Laboratory Network.

At the end of the festival, the 3rd Iran Nano-Awards Ceremony was held. This ceremony is held every year to recognize the top nanotechnologists in Iran. Winners are selected from different categories, ranging from R&D centers to media and from university professors to young enthusiastic researchers.

Comments on the exhibition:

"The exhibition reflects the success of nanotechnology research activities in Iran, and the products exhibited show the strength of Iranian companies in engaging nanotechnologies in their businesses. I believe that Iran research institutes and companies will play a vital role in the field of Nanotechnology in future".

Peter Hatto
Chairman ISO/TC229.

"I've been truly impressed by the quality of exhibition in general. People are cooperative and knowledgeable. Products look promising, some are in use already".

Prof. Dmitry Kuznetsov
Inst. Chemical Physics
Russian Academy of Sciences
Moscow, Russian

Other Nano Events

1) Iran-India Joint Conference on Nanotechnology (IIJCN 2009)

The 2nd Iran-India Joint Conference on Nanotechnology (IIJCN2009) was held in Isfahan, Iran, during May 5-7, 2009.

The IIJCN 2009 was organized by the University of Isfahan and co-sponsored by the Iran Nanotechnology Initiative Council (INIC).

It consisted of invited lectures, poster sessions, workshops and an exhibition. The invited lectures were delivered by the leading scientists. Nano Physics, Nano Chemistry, Nano Medicine, Nano Materials, Nano Biotechnology, Nano Electronics, Environmental Aspects of Nanotechnology and the applications of Nano in Medicine and Pharmacy, were the subjects covered in IIJCN2009.

2) NAM Workshop on Nanotechnology

The Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) jointly with Iran Nanotechnology Initiative Council (INIC) organized a 3-day international workshop on nanotechnology named "Present Status and Future Prospects in Developing Countries" from 18-20 May 2009 at Kashan.

Technical sessions at the workshop were conducted in nine broad categories under four main themes: 'Characterization and Synthesis of Nano-Materials', 'Applications of Nanotechnology', 'Nanotechnology: Policy, Strategy and Market Development' and 'Nanotechnology: Status and Prospects in Developing Countries'.

The workshop was attended by 35 experts and senior professionals from 16 countries including Armenia, Cuba, India, Indonesia, Iraq, Kenya, Libya, Malaysia, Mauritius, Myanmar, Nigeria, South Africa, Sri Lanka, Syria and Uganda, and the host country Iran.

3) ECO Nanotechnology Network Meeting

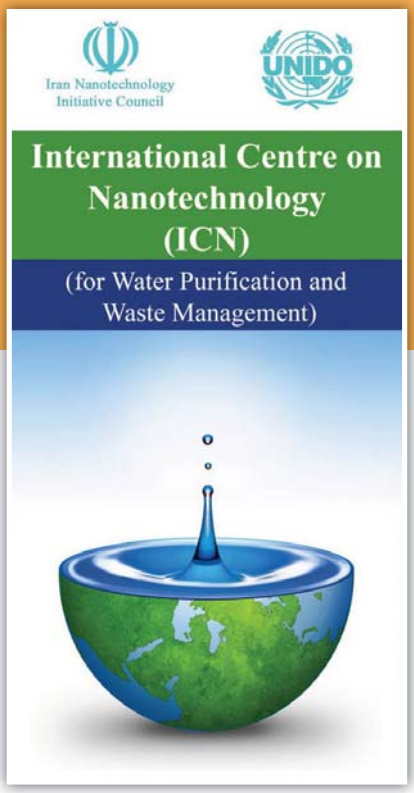
The ECO Nanotechnology Network was officially opened on Tuesday, May 26th, 2009 in the presence of officials from Economic Cooperation Organization (ECO), ambassadors of member countries and administrators of Iran Nanotechnology Initiative Council.

The aims of this network, which was initially proposed by the Iran Nanotechnology Initiative Council, are to promote nanotechnology in the member countries, exchange technical experiences, improve the economical position of ECO in knowledge-based transactions, and finally, enhance the quality of life in member countries.

4) ANF Summit 2009

The sixth ANF (Asian Nano Forum) annual summit was held in the Institute of Physics, Academia Sinica, Taipei, Taiwan on October 2009. Iran, as one of the recent members of ANF, participated in this event alongside other member economies.

Each economy presented a status report on their activities in the field of nanotechnology which included their



latest research and achievements.

The mission of the ANF is to promote the research and development and industrialization in nanotechnology by fostering international networking and collaboration, which educationally, socially, environmentally and economically benefits each economy.

Iran became a member of the ANF in May 2009.

5) INIC, UNIDO Agreement Signed on the Establishment of a Nano Center

The Secretary General of the Iran Nanotechnology Initiative Council (INIC), Dr. Saeed Sarkar, and Deputy Director-General of United Nations Industrial Development Organization (UNIDO), Yoshi Uramoto, signed an agreement at UNIDO's central office in Vienna on Friday September 25, 2009 to establish an international nanotechnology center.

This will be the first international UNIDO center which plans to apply nanotechnology in water sweetening and water/wastewater treatment at national, regional and international levels. In addition to its technical significance, the center will reflect Iran's scientific and technical potential at the international level.

During the first half of 2007, INIC prepared a comprehensive report on Iran's abilities in integrating nanotechnology into water/wastewater treatment fields for UNIDO. Regarding the importance of world water/wastewater problem, the establishment of this international center for nanotechnology was approved by Iran and UNIDO.

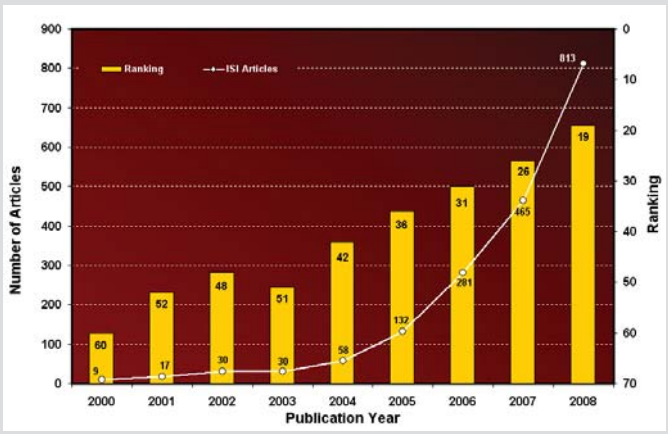
Right: Dr Saeed Sarkar, The Secretary General of INIC; **Left:** Professor Rao, the Director of the JNCASR

6) Trip to India

INIC directors traveled to India on 16 November 2008 to visit science and technology centers in the country, and to establish scientific relations between the two countries. This journey was made at the invitation of Professor Rao, the director of the JNCASR center and an eminent Indian researcher. The two countries agreed to organize post-doctoral courses and hold several conferences with the aim of exchanging knowledge on recent achievements in Iran and India.

Iran's World Rank in Nanotechnology

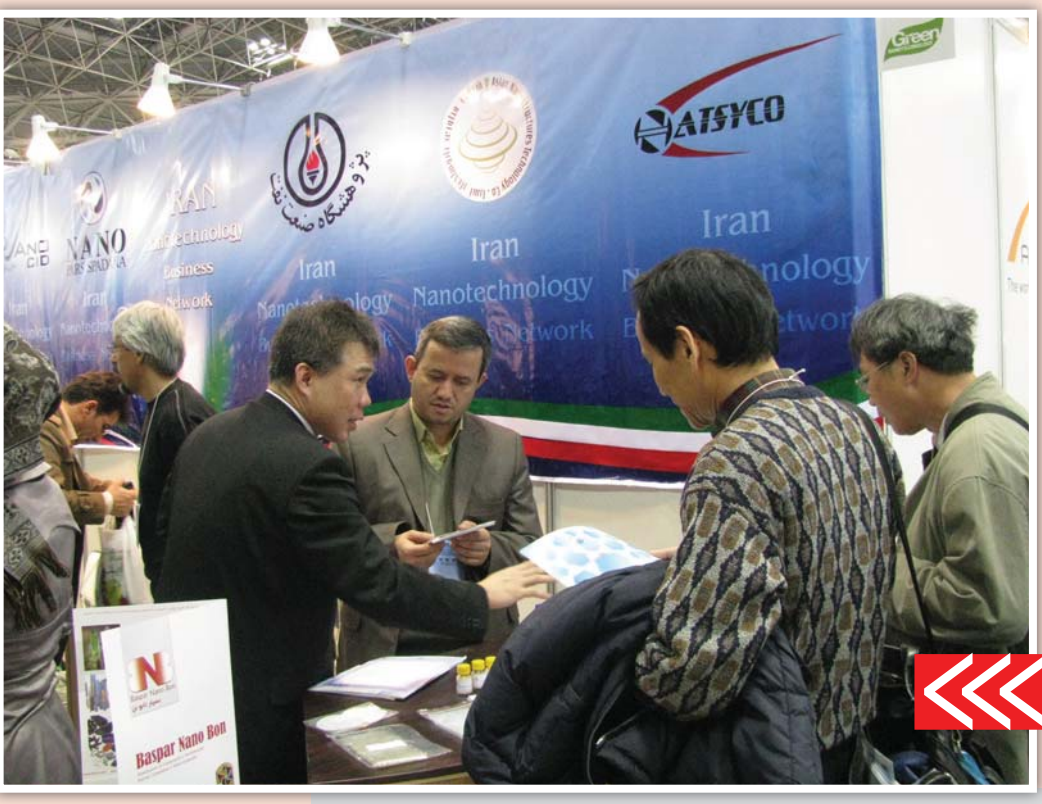
Human resources are one of the basic requirements for any development plan. Taking the number of ISI publications as an indicator of science production one can monitor the improvement of Iran in this field. In 2003, when INIC was established, the number of nanotechnology-related ISI papers in Iran was only 30. This put Iran in 51st position in the world ranking. At the end of the third quarter of 2009, Iran was ranked 15th, having published 912 ISI papers in this field. From 2003 until now, Iran has enjoyed the highest rate of growth in this ranking in the world. The figure below displays the rate of increase in the number of ISI papers and Iran's global ranking in this field within the period of years 2000 to 2008. The table below shows the number of nano-articles for top 20 countries published from January to September 2009.



Rank	Country	Number of Nano-Articles January-September 2009
1	China	12368
2	USA	10591
3	Japan	3960
4	Germany	3658
5	south korea	2753
6	France	2596
7	India	2323
8	Uk	2055
9	Spain	1625
10	Taiwan	1622
11	Italy	1570
12	Russia	1399
13	Canada	1321
14	Australia	1014
15	Iran	912
16	Singapore	864
17	Switzerland	783
18	Netherlands	739
19	Brazil	667
20	Poland	652

Iran in International Exhibitions

The Iran Nanotechnology Business Network (INBN) has participated in three exhibitions in the last year.



1) Japan Nano Tech 2008 & 2009

The exhibition at Japan Nano Tech is one of the greatest international trade fairs held in the field of nanotechnology each year, bringing together many countries active in the field. The vast majority of the participants at this trade fair seek new investment ideas; as a result, participating in this exhibition is considered as a great opportunity in the context of new trade opportunities.

In the 2008 exhibition, Iran was the only participant from the Middle East. The aim of this participation was to increase the insight of international nano-companies into the capability of Iranian companies in the field of nanotechnology. More than 5000 delegates visited the Iranian pavilion, dedicated to the display of products from several Iranian companies. The majority of the visitors expressed their admiration for Iran's achievements. About 10% of the negotiations conducted in this period were considered by Iranian companies to be serious, with potentially positive outcomes.

2) NanoEurope 2008

The NanoEurope exhibition held in St. Gallen in Switzerland each year brings together companies, research centers, universities and certified international organizations active in the field of nanotechnology. In 2008, INBN, together with representatives from 6 Iranian companies and the Research Institute of Petroleum Industry, took part in the exhibition.

Considering the motto of the exhibition "Beyond Regulation – Voluntary Measures in Nano Risk Governance", it could be understood that identifying and dealing with the potential risks of nanotechnology was the main focal point for both the exhibition and participating European countries. Alongside this trade fair, the 4th international conference regarding nano-regulations was held, and proved popular with the attendees. The general nano-fair, staged alongside the specialized exhibition, discussed the basic definitions of nanotechnology in simple terms.

A poster section was mounted alongside the exhibition; 15 of the 61 posters presented were from Iran. Many participants visited the Iranian booth, one of the biggest pavilions in the exhibition; they all were impressed by the achievements of Iranian researchers in the field of nanotechnology. These visits also paved the way for further international collaborations.

3) Rusnanotech 2009

This international nanotechnology exhibition was held by Rusnano on October 6-8, 2009 at Moscow's Central Exhibition Complex, and indicated the growing importance of nanotechnology to this country.

INBN supported the participation of 7 Iranian companies in the exhibition, with the goal of developing international cooperation and comparing their competences with that of their international rivals.

In view of the fact that there were more than 300 booths from 17 countries in the exhibition, that the Iranian pavilion attracted about 3000 visitors is considered an indication of its popularity. It should be noted that the Russians also welcomed the Iranian booth and its products.

Iran also participated in Rusnanotech 2008.

Bringing Nano to the Public

Programs for popularizing and educating the public in nanotechnology fall into two categories:

• Education: through training high school and university students on nanotechnology basics;
• Improving public awareness: by presenting the general public with nano products.

1) Training students on nanotechnology:

• Establishment of a nanoclub, aimed at educating students on nanotechnology science. Interested students can study the general facts of nanotechnology in the club; the brighter ones are encouraged to conduct more research in this area.
• Holding 220 educational workshops for high school students and teachers; Understanding the nano-scale, the physical, chemical and biological changes of materials at this scale, and the uses of nanotechnology in different industries, are the main topics discussed in these workshops.
• Holding different public shows every year. In these public shows, students become familiar with nanotechnology products and applications.

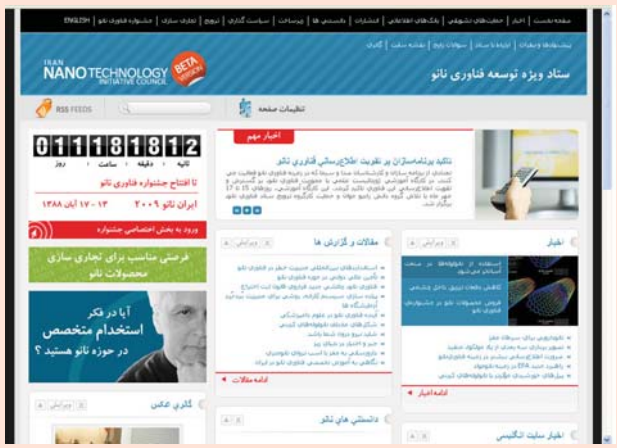
In the first public show held on 13-15 October

2008, during Iran Nano 2008 (the First Iran Nanotechnology Festival), more than 3000 students were introduced to nanotechnology products including nano-membranes, fuel cells, nano-hydrogels for stabilizing soil, etc.

The second public show was held in Karaj (a big city near Tehran) and more than 600 students participated in the event.

2) Improving public awareness:

- Publication of a nanotechnology monthly magazine; 145 issues have been published between 2002 and October 2009;
- Publication of nanotechnology articles in industrial journals (23 journals) during the year 2008;
- Publication of nano-news in news agencies: more than 1300 nano-news items were published in 4 news agencies – isna.ir, irna.ir, mehrnews.com, and farsnews.com – during the year 2008 (showing a 45 percent increase compared to the year 2007);
- Broadcasting nanotechnology programs on television and radio channels;
- Issuing nano-related information on the website of the Iran Nanotechnology Initiative Council (http://nano.ir/) in the form of news, articles, reports, databanks, etc.



Iranian achievements in the field of nanotechnology

Nanotechnology, the technology of the third millennium, is already providing people with better products. Products made using nanotechnology are not only less expensive but are also more effective; these products, moreover, are considered to be more compatible with the environment and thus improve the quality of life. In order to achieve similar goals, Iranian researchers are using nanotechnology to improve existing products and produce new ones that meet national and international needs. In the following there are three examples of the achievements of Iranian researchers in this field.

1) Refining Karun River's water using a nanofiltration system with the capacity of 60 m^3 per day (for the first time in the country)

The feasibility of using nanofiltration in refining the Karun River's water was evaluated in four different phases - study, research, experimental and semi-industrial phases.

In this project, scientists used nanofiltration technology to design a device capable of producing water of an acceptable quality (based on the available standards) from brackish sources. The objective of the project was to develop a new system to refine and reduce the hardness (TDS) of contaminated water with low salinity levels, with the aim of producing drinking and irrigating water. Unlike the currently used methods, this technique is not only less expensive but also less likely to pollute the environment. Moreover, the new technique is considered to overcome the high cost of public water supply systems caused by the corrosion and leakage of water pipes and the resulting poor water quality. Researchers are optimistic that the new technique will solve the problem of water supply for towns located in remote areas. The project will also help individuals to build refinery-like systems in any area at a lower cost but offering a high water quality.

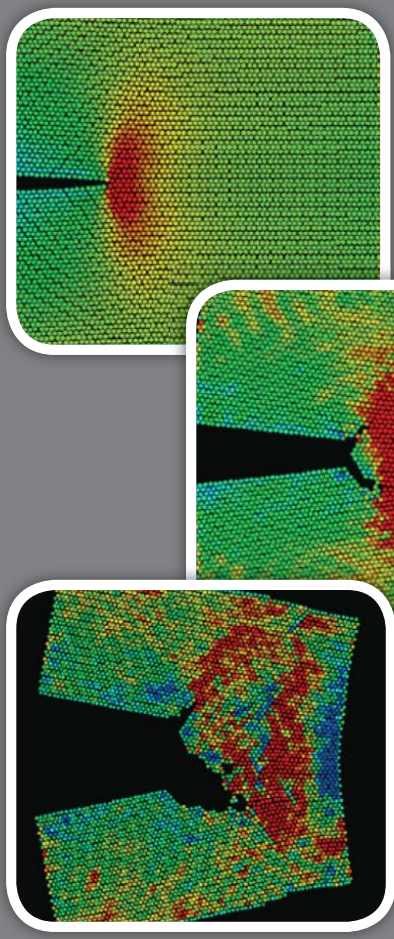
This new refinery system is the only one of its kind in the country. It provides individuals with the capability of refining brackish water without posing any risk to the environment or producing polluting gases. This system can also help refine and separate dangerous and poisonous components such as heavy metals and elements such as arsenic. From the gathered data, using this system for refining brackish water has both technical and economic justifications.

2) Reinforcing concrete using nanotechnology

In this project, conducted in cooperation with INIC, scientists used nano-silicone to reinforce concrete structures. The object was to improve the quality of the concrete used in national construction projects.

In view of the fact that the wearing down of concrete structures imposes a heavy cost burden on countries, scientists all around the world are seeking to improve the quality of this product using nanotechnology. Similarly, Iranian researchers have decided to use nanotechnology in reinforcing their concrete structures.

They assessed the technical and economical aspects of the project and conducted basic research on the structure of nano-silicone particles and the quality of products made using them. They are now looking forward to evaluating the efficacy of the product in practice by building a 100-meter concrete harbor.



3) Nano Grid

The first Iranian Nano-Grid was inaugurated in the Institute for Research in Fundamental Sciences to provide researchers with complicated computational tools. All the specialists in the field of nanotechnology are able to use the facilities of this center, which is considered as the new member of the Nanotechnology Laboratory Network in Tehran.

The current capacity of the computational center is reportedly about 500 gigaflop, expandable to 1 teraflop (10^{12} process per second). It is a computational cluster parallel processing system with 144 computational cores; it helps scientists to perform scientific and technological calculations that are ten times more complex than before, paving the way to improving nanotechnology experiments in the laboratory and in industry.

"We are looking forward to being able to undertake the complex calculations which will underpin many laboratory experiments at the nano scale" said Hashem Rafii Tabar, the head of the center in the inauguration ceremony of the center. Rafii Tabar added that there is no similar center in the Middle East.

The center provides the students and researchers with advanced facilities for exploring nanoscience phenomena at multiple scales. Information on the Nano-Grid is accessible through the nanotechnology laboratory web page http://www.nanolab.ir and http://www.ipm.ac.ir.

IRAN NANO 2009 is planned for setting up collaborations/communications between various local, regional and international research centers, universities, R&D groups, standard organizations as well as scientific communities.

IRANANO 2010

INTERNATIONAL NANOTECHNOLOGY FESTIVAL

Iran Nanotechnology Festival 2010 – even bigger than before!

The third Iran Nanotechnology Festival will be held in 2010 in Tehran, Iran. It will include all the activities of previous festivals, including a show for the public, an industrial exhibition and technology corridor - but on a greater scale of national and international involvement.