

Iran Nanotechnology Initiative Council (INIC)

Iran initiated its activities in nanotechnology in 2001, and in 2003 established the Iran Nanotechnology Initiative Council, INIC, (www.nano.ir/en) to promote nanotechnology. In 2005 “Future Strategy”, a 10-year nanotechnology development plan was adopted by the Iran Cabinet. Iran aims to be among the world’s top 15 countries in nanotechnology, as a means of achieving economic development. Currently, there are more than 5000 scientists and researchers working in nanotechnology in Iran, and 3079 papers have been published in ISI journals between 2000 and 2009. Educational and public awareness program have been followed by INIC through media and schools. Many patents have been registered by Iranians and more than 50 laboratories offer professional services, as part of the Iran Nanotechnology Laboratory Network (www.nanolab.ir). In 2006, the Iran Nanotechnology Standardization Committee (INSC) was established, and currently Iran is a member of the board of the International Committee on Standardization (ISO/TC229), and will host the 12th meeting of this Committee in 2011. The INIC supports R&D, commercialization, incubator centers, prioritized projects, foreign investment and joint ventures. A “Nanotechnology Festival” and “Nanotechnology Awards Ceremony” are held annually in Iran. For all above activities INIC has allocated special working groups to handle related matters.

Bringing Nano to the Public

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

1. Training high school and university students in nanotechnology basics
 2. Improving public awareness
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1. Training students in nanotechnology is achieved through:
 - The establishment of a Nanoclub, aimed at educating students in nanotechnology and nanoscience.

- Holding educational workshops for high school students and teachers.

Understanding the physical, chemical and biological changes of materials at the nano-scale, and the application of nanotechnology to different industries, are the main topics discussed in these workshops.

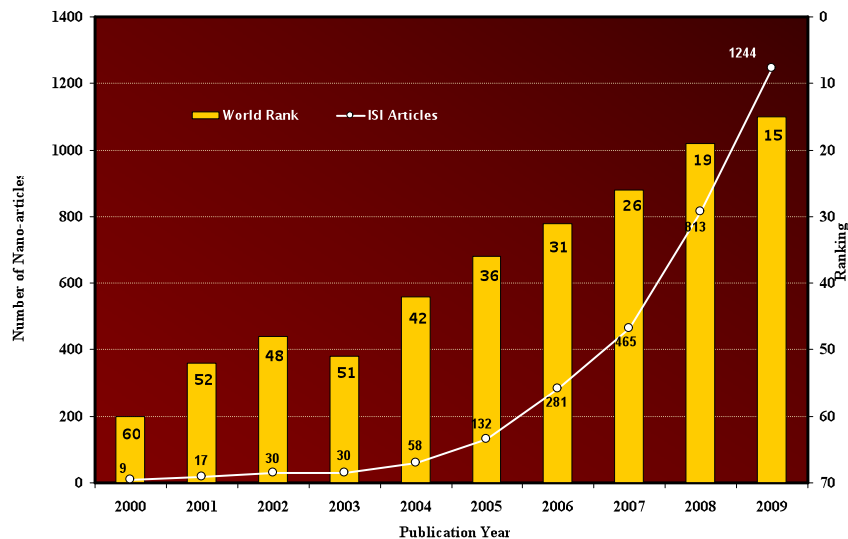
- Holding different public shows every year. At these public shows, students become familiar with nanotechnology-related products and applications.

2. Improving public awareness through:

- The publication of a nanotechnology monthly magazine
- The publication of nanotechnology articles in 38 industrial journals.
- The publication of nano-news in news agencies
- Broadcasting nanotechnology programs on television and radio.
- Issuing nano-related information on the website of the Iran Nanotechnology Initiative Council (<http://www.nano.ir/>) in the form of news, articles, reports, databanks, etc.

Iran's World Rank in Nanotechnology

At the end of 2009, Iran was ranked 15th, having published 1244 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 between 2000 and 2009.



Infrastructures available for developing nanotechnology in Iran

In 2003, the Iran Nanotechnology Initiatives Council (INIC) set up a special working group to implement the necessary infrastructures for developing nanotechnology in Iran. This working group was responsible for a program to establish or strengthen all the necessary infrastructures, such as advanced laboratories, standards, metrology and intellectual property. Below is a brief account of what they have achieved so far.

Iran Nanotechnology Laboratory Network (INLN)

One of the most important requirements of researchers and industries active in nanotechnology is having access to reliable services through accredited laboratories. For this purpose INLN was established in 2004. Currently, this network covers around 40 advanced laboratories in more than 12 important cities.

See: www.nanolab.ir

INIC supports the INLN in various ways related to the ranking and appraisal of the member laboratories, as follows:

- 1- Training laboratory technicians
- 2- Repair and maintenance of lab equipment
- 3- Purchasing of new equipment
- 4- Acquiring recognized lab standards, in particular ISO17025.

INLN also financially supports the manufacturers of the advanced equipment needed for nanotechnology research.

INLN also intends to develop its cooperation with international laboratories and facilities, in particular in the Middle East and in Islamic countries, exchanging information and services.

Iran Nanotechnology Standardization Committee

Considering the significance of standardization in the development and commercialization of nanotechnology, the Institute of Standards and Industrial Research of Iran, together with the INIC, set up the ISIRI/TC299 in 2006.

From the very beginning this committee was a member of the International Committee on Nanotechnology Standardization (ISO/TC229) and has actively participated in international programs on nanotechnology standardization.

So far this committee has received and examined over 20 proposals on standards from the International Committee, and has offered Iran's comments and views on these. Iran is one of the few countries which has put forward a New Work Item Proposal (NWIP) on adopting an International Standard to the ISO/TC229 committee. This proposal, called "Nanotree", deals with classifying nano materials, and was accepted by member countries in 2007. It is anticipated that within the next two years it will be published as an international standard of type TR.

In 2007, INSC set up three other specialized subcommittees on standardization in the areas of terminology, measurement (calibration) and safety, with more than 40 nano specialists participating.

Nanometrology and Nanoinstrumentation Center

Following some preliminary studies, the creation of a nanometrology and nanotechnology instrumentation development center was ratified in Iran in 2006. This center is now at the construction stage.

INIC International Relations

Iran's international relations with the world nanotechnology community includes the following:

Regional and International Organizations:

- ECO-NANO: This network consists of ten members of the Economic Cooperation Organization (ECO) and was established by INIC in 2009 in order to develop economic growth through nanotechnology.
- Asia Nano Forum (ANF): The Asia Nano Forum is a network organization, founded in May 2004, to promote excellence in research, development and the economic uptake of nanotechnology within the Asian region. Iran became an active member in 2009.
- UNIDO: INIC and the UN Industrial Development Organization signed a document regarding a nanotechnology research centre which will focus on the purification of water and wastewater, and is UNIDO's first centre of nanotechnology.
- NAM SciTech Centre: Iran became a member of the Non-Aligned Movement Science and Technology Centre in 2008 by holding the first nanotechnology workshop among member countries.
- ISO/TC229: Iran participates actively in the International Nanotechnology Standardisation Committee (ISO/TC229), contributing to the compilation of international standards on nanotechnology, and participating in the Committee's meetings in France, Germany, Singapore, China, and USA.

Collaboration with Other Countries:

- India: A memorandum of understanding between INIC and the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) was signed, which led to holding 2 Iran-India Joint Conferences on Nanotechnology (IJCN) and a number of joint projects.
- Russia: A number of joint projects on nano-medicine and nano-composites are taking place.
- Ukraine: A memorandum of understanding was signed between INIC and the Ukrainian National Academy of Science (UNAS) on various aspects of nanotechnology, including nano-materials and laboratory collaboration.
- A memorandum of understanding was signed with Brazil, on future cooperation in nanotechnology.

Technology to Market Services Corridor

To reduce the time to market for high-tech products and facilitate commercialization and industrialization of technology, INIC has set up a "Technology to Market Services Corridor".

This corridor is a set of service companies and back up institutions that provide services in the field of technology development. The services offered in this corridor are nanoscale assessment, documentation, patenting, technology transfer, business planning, venture capital investment etc.

Iran Nanotechnology Companies:

The table below shows the type and number of Iranian companies active in the field of nanotechnology:

Type of Company	No.
Companies that have already introduced a nano product to the market	24
Companies that have been successful in making a nano-product and are in the process of commercializing	11
Spin-offs from universities/research centers, with a nano-product in the stage of commercializing	25
Service vendors (IP, Training, ...)	12
Trading companies	9
Instrument-producing companies	10
Other companies investing on R&D in nanotechnology	40
Total no. of companies involved in nanotechnology	131

A number of Iranian technological and manufacturing companies and their products are introduced below:

1. NANOPAC PERSIA Co.

- Nano treatment solutions for air/water/soil with antibacterial, deodorization and purification properties
- Nano air conditioning filters for home use (refrigerator, baby room, car, etc)
- Nano industrial air ventilation systems
- Nano absorbent for packaging fruits and vegetables
- Nano titanium dioxide coating with self cleaning properties

www.nanopac.org

2. NARMIN SHIMI NOVIN Co.

- Nano silver and TiO₂ particles
- Anti stain and water resistant textile
- Nano additives for damping electromagnetic waves

www.narminchemi.com

3. PISHGAMAN NANO ARIA Co.

- Motor oil (NANIAX) and a motor oil additive based on nano diamond particles

www.naniax.com

4. NANO TECHNOLOGY SYSTEM CORPORATION (NATSYCO)

Scanning Tunneling Microscopes (NAMA-STM)

www.natsyco.com

5. Parsa Polymer Sharif Co.

- 'Silent' pipes based on nano particles
- Scratch resistant polymers
- Polypropylene/clay nano composites
- Polypropylene/glass fiber composites

www.parsapolymer.com

6. PADJAME Co.

- Anti-stain; water and oil repellent textiles

7. KAVEH FLOAT GLASS Co.

- Nano coated glass, such as Low-E and Solar control

www.kavehglass.com

8. CHITO TECH Co.

- Wound care products (sprays and dressings) based on nano silver particles

www.chitotech.com

9. NANO SINA Co.

- Breast cancer diagnosis kits

10. NANOAB IRANIAN Co.

- Stabilizer for anionic soils that improves the load bearing performance of clays and soils

www.iramontinc.com

11. GERAD AFARIN Co.

- Anti-stain and water-resistant menswear

www.geradco.com

12. NANO PARS SPADANA Co.

- Nano zinc oxide
- Nano gamma alumina
- Nano copper oxide
- Nano lithium cobalt oxide

www.nanops.ir

13. BASPAR NANO BON Co.

- Nano polymer processing aid
- Nano color master batches (black, white, yellow, blue, green, red, etc)
- Nano engineering compounds (reinforcement, lighten, shrinkage, etc)
- Nano films for food packaging (antibacterial, antimicrobial, gas impermeable)

14. NOAVARAN CATALYST Inst.

- Nano Zinc Oxide

www.catalyst-institute.com

15. BONYAN NANO FANAVERN PARS Co.

- Fuel additive based on a nano emulsion that reduces fuel consumption

16. NATIONS BIO RESEARCHERS Co.

- Ethylene and fungi removal systems in fruit cold stores and containers

17. ASIA TECHNOLOGY PIONEERS Co.

- Durable polyacrylic paints based on nano particles

www.atpioneers.com

18. FANAVERAN NANO MEGHYAS Co.

- Programmable electro-spinning systems in laboratory and industry scales

www.fnm.ir

19. ASIAN NANO STRUCTURE TECHNOLOGY Co.

- Laboratory scale electro-spinning system

www.anstco.com

20. FANAVERAN CARBON TARARA Co.

- Carbon nanotubes

21. PAYA PLASTIC ARYA Co. (PAYACO)

- Packaging for foods and fruits based on nano zeolites

22. RAVANKARAN SANAT Co.

- Motor oil based on nano alumina and nano Cr₂O₃

www.ravankaran.com

23. AVIN PALAYESH NIROO Co.

- Ø Water purification equipment based on nano filtration

24. MEGHNATIS DAGHIGH KAVIR KASHAN Co.

- Vibrating Sample Magnetometers (VSMs)

25. ARA PAJOOHESH Co.

- Atomic Force Microscopes (AFM)

www.ara-research.com

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