THE RISKS AND ADVANTAGES OF NANOTECHNOLOGY IN TECHNICS, HEALTHCARE AND ENVIRONMENT PROTECTION

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I. INTRODUCTION

Implementing sustainable development for the short and long term involves a range of actions to strengthen scientific and technological capacity and cover the various social, economic and environmental dimensions.

Nanotechnology has now become an umbrella term used to encompass the study, manipulation and application of matter based on its properties at the atomic scale. The ‘nano’ prefix derives from the Greek noun nanos, meaning dwarf. A nanometre (nm) is one billionth (1 x 10-9) of a metre: the length of ten hydrogen atoms placed side-by-side, or 1/80000th of the thickness of a human hair. Nanotechnology is now generally considered to relate to the organisation of atoms and molecules within a size range of 1 to 100+ nm, although much larger structures, devices and systems that incorporate or owe their existence to such entities are also described as nanotechnological.

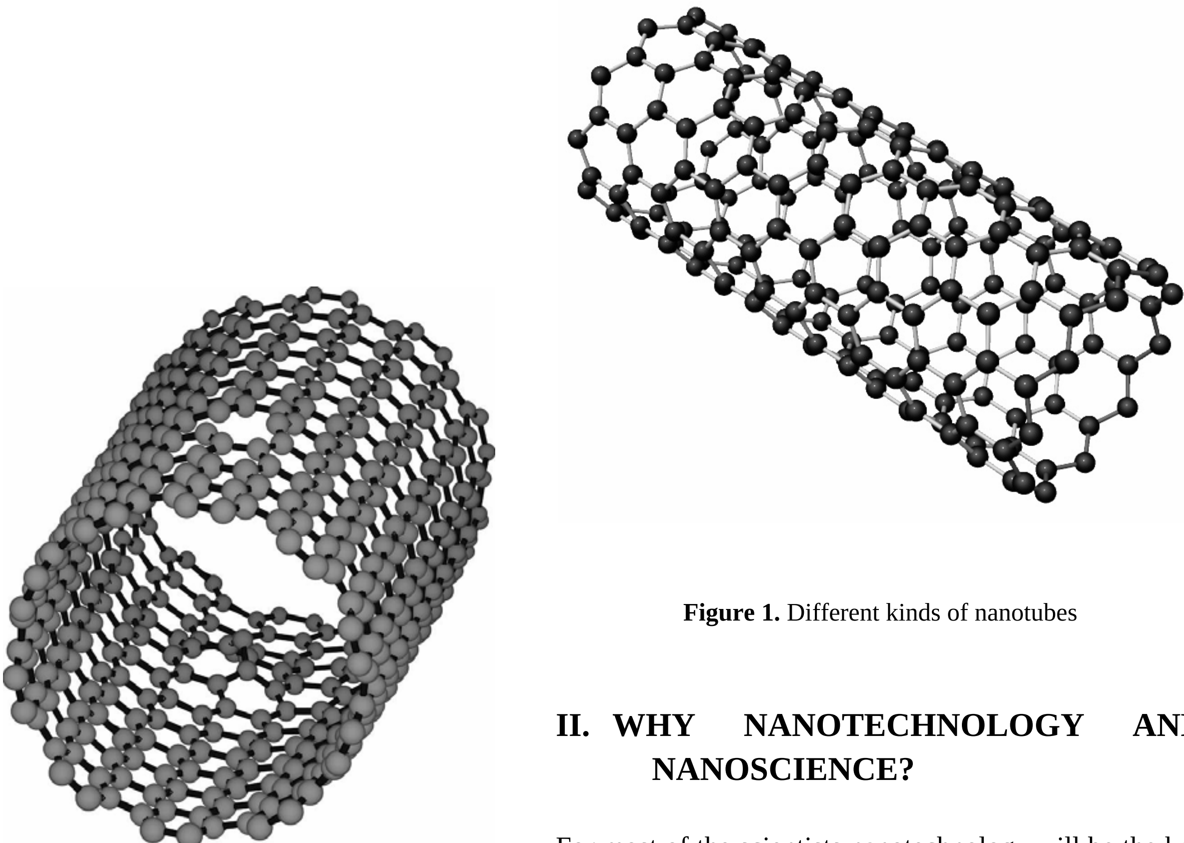


Figure 1. Different kinds of nanotubes

II. WHY NANOTECHNOLOGY AND NANOSCIENCE?

For most of the scientists nanotechnology will be the key technology for the 21st century, a new technology able to make products smaller and stronger and essentially for the control of matter at the molecular level.

Nanotechnology has two-fold potential, in offering solutions to many current problems and expectation of citizens and in opening opportunities for wealth creation and new employment by turning fundamental research into successful innovations.

Nanotechnology makes some essential contributions to solving global, environmental and medical challenges through a better use of resources and less waste.

Nanotechnology is necessary for electronics and informatics, biotechnology and biomedicine, for standards, measurements and testing methods.

Nanotechnology covers the domains of human health, environmental impacts, effects on international trade and possible proliferation in armaments.

III. NANOTECHNOLOGY RISKS [1]

Scientists are concerned about the implications of nanotechnology, if it is any danger it needs to be investigated.

Its extreme supporters claim that nanotechnology can rebuild the human body from within and effectively abolish death while its enemies fear instead, it could do away with life, by turning the surface of the Earth into an uninhabitable grey mess, states the report, by way of introduction. The truth probably lies somewhere between these extremes, it adds.

Three areas are highlighted as central to the debate on nanotechnology: [2]

- the governance of technological change;
- social learning and the evaluation of risk and opportunity under uncertainty;
- the role of new technology in ameliorating or accentuating inequity and economic divides.

Researches want to be sure if nanotechnology is not against us and which is the social impact.

Health is concerned in inhalation, ingestion and transdermally (these are the three means which nanoparticles can pass into human body).

Breathing in very small particles has toxic effects and it doesn’t seem to matter what they’re made, the toxicity increases as the size of particles decreases. Another worry is where the particles get to within the body. What happens if the nanoparticle gets to the brain?

Possible impact of nanotechnology may be on military operations.

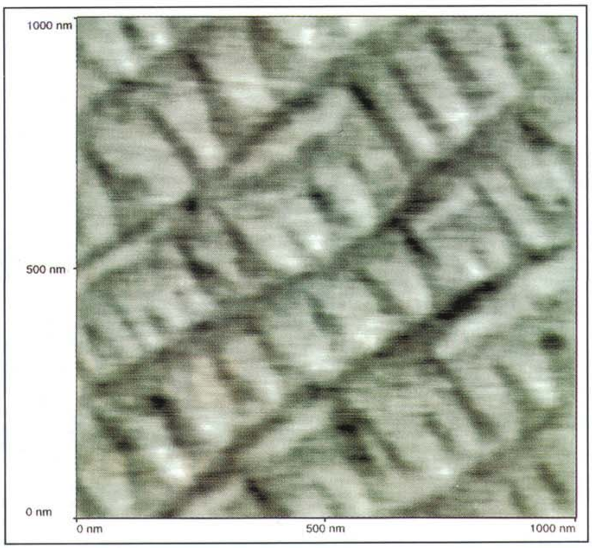
Groups of scientists are working independently. They don’t seem to be talking one another.

Researches will establish the properties of aggregates of nanoparticles and the potential of insoluble nanoparticles to act as carriers with other toxic chemicals.

IV. WAYS FOR NANOTECHNOLOGY INVESTIGATION

Scanning Probe Microscopy (SPM) has improved our understanding of thin-film growth, defect formation on surfaces, and other important issues in materials science and engineering.

In virtually every field of scientific endeavour, there is a growing need to investigate materials on the nanometre scale. From semiconductors to biomaterials, features of critical importance to product performance or the understanding of physical and chemical processes are shrinking in size. The ability to measure these features, define their properties and characteristics, and manipulate a material’s structure at the molecular and even atomic level, is becoming a necessity, not only for scientific studies, but also for manufacturing and analytical applications. The scanning probe microscope is a tool that is enabling scientists and engineers to advance the state of the art in nanotechnology.



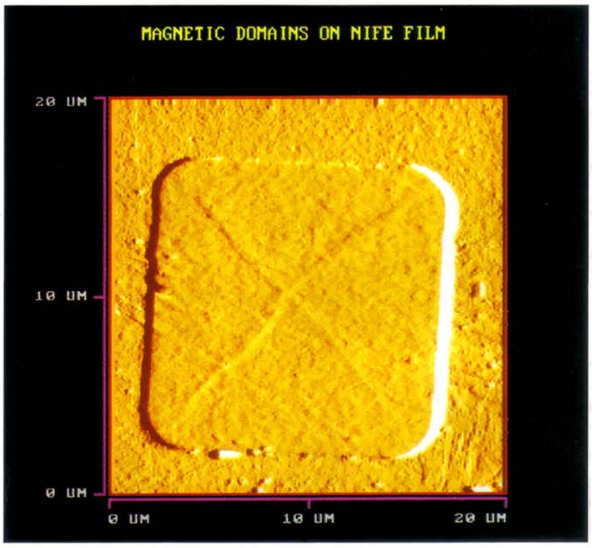


Figure 2. Two examples of where scanning probe microscopy (SPM) is being used in materials science and engineering. SPM image of epitaxial silicon, left, shows atomic-step terraces. Magnetic force image of a Ni-Fe alloy film, right, shows domain walls.

V. CONCLUSIONS

- A risk needs to be identified before its consequences can be measured
- Nanotechnology means small matter, many unknowns
- We have to know if nanoparticles pose a threat to people or the environment
- A number of new nanotechnology products were launched commercially following a relative short phase of research and development

VI. BIBLIOGRAPHY

[1] Cordis focus – March 2006
[2] Cordis focus – June 2003