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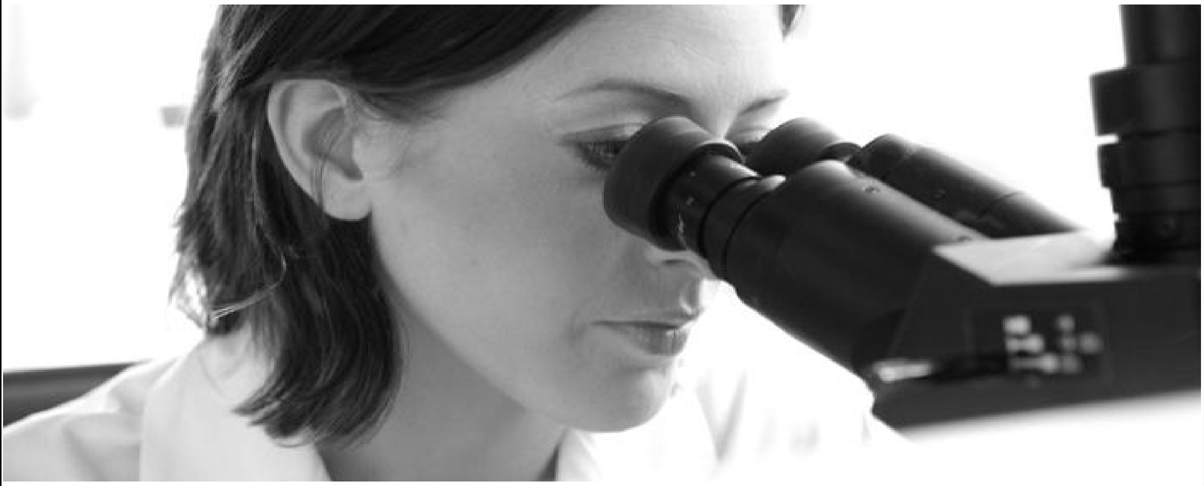

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RESEARCH ARTICLE

NANOSCIENCES, NANOTECHNOLOGIES, MATERIALS AND NEW PRODUCTION TECHNOLOGIES (NMP)

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ABSTRACT

The nanosciences, nanotechnologies, materials and new production technologies (NMP) cover a wide spectrum of technologies and industrial sectors. The NMP theme focuses on smart and sustainable growth towards a greener industry. It covers a large range of industrial research activities. The research will focus on new applications and novel solutions responding to major challenges. Nanosciences and nanotechnologies are new approaches to research and development that aim to control the fundamental structure and behavior of matter at the level of atoms and molecules. As a consequence, different application sectors are concerned by the approach, so the aim is to strengthen the competitiveness of industry by generating 'step changes' in a wide range of sectors and implementing decisive knowledge for new applications between different technologies and disciplines.

The central objective of the NMP theme is to support the transformation of industry from a resource-intensive industry (relying on raw materials, labor, energy etc.) to a sustainable knowledge-intensive industry. For future growth and employment, industry must incorporate knowledge into products with high added value and make processes more efficient.

INTRODUCTION

The field of 'Nanosciences, Nanotechnologies, Materials and new Production Technologies' (NMP) is a still-young area of research and development. Nanosciences and nanotechnologies are new approaches to research and development that aim to control the fundamental structure and behavior of matter at the level of atoms and molecules. As a consequence, different application sectors are concerned by the approach, so the aim is to strengthen the competitiveness of industry by generating 'step changes' in a wide range of sectors and implementing decisive knowledge for new applications between different technologies and disciplines.

The developed countries committed to the long-term, sustainable growth of this burgeoning field through federal funding programs and an extensive infrastructure of research and development centers, networks, and user facilities. Smart materials have a wide variety of possible commercial applications. One example would be materials designed to respond differently to various molecules; such a capability could lead, for example, to artificial drugs which would recognize and render inert specific viruses. Another is the idea of self-healing structures, which would repair small tears in a surface naturally in the same way as self-sealing tires or human skin.

Advantage

Advantage of Nanotechnology make materials fifty times lighter than steel or aluminum alloy but with the same strength. We'll be able to make jets, rockets, cars or even chairs that, by today's standards, would be remarkably light, strong, and inexpensive. Molecular surgical tools, guided by molecular computers and injected into the blood stream could find and destroy cancer cells or invading bacteria, unclog arteries, or provide oxygen when the circulation is impaired.

Risks

Molecular nanotechnology is one of the technologies that some analysts believe could lead to a Technological Singularity. Some feel that molecular nanotechnology would have daunting risks. It conceivably could enable cheaper and more destructive conventional weapons. Also, molecular nanotechnology might permit weapons of mass destruction that could self-replicate, as viruses and cancer cells do when attacking the human body. A fear exists those Nano mechanical robots, if achieved, and if designed to self-replicate using naturally occurring materials (a difficult task), could consume the entire planet in their hunger for raw materials, or simply crowd out natural life, out-competing it for energy. Some commentators have referred to this situation as the "grey goo" or "ecophagy" scenario.

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Future

For the future, some means have to be found for MNT design evolution at the nanoscale which mimics the process of biological evolution at the molecular scale. Biological evolution proceeds by random variation in ensemble averages of organisms combined with culling of the less-successful variants and reproduction of the more-successful variants, and macroscale engineering design also proceeds by a process of design evolution from simplicity to complexity as set forth somewhat satirically by John Gall: A working nanofactory would require a variety of well-designed tips for different reactions, and detailed analyses of placing atoms on more complicated surfaces. Although many tools will be available to help future researchers: Moore's Law predicts further increases in computer power, semiconductor fabrication techniques continue to approach the nanoscale, and researchers grow ever more skilled at using proteins, ribosomes and DNA to perform novel chemistry.

Object

They show considerable enhancement of solid solubility over the conventional alloy systems.

It is possible to produce new high strength steels by use of a dispersion phase such as carbide in a nanoscale dimension. Several conventional difficulties encountered in fabrication of ceramic matrix related to particle agglomeration and infiltration can be overcome by use of nanopowders. An enhanced surface area because of the small size of the nanocrystal is obtained. Coatings with nanoparticles would generate novel surface with anti-wear, anti-corrosive, anti-static and anti-bacterial. It would be possible to develop a fast and on to target drug delivery system.

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