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History of Science and Technology

EP*Magazine* N. 34, Issue 1, April 2014

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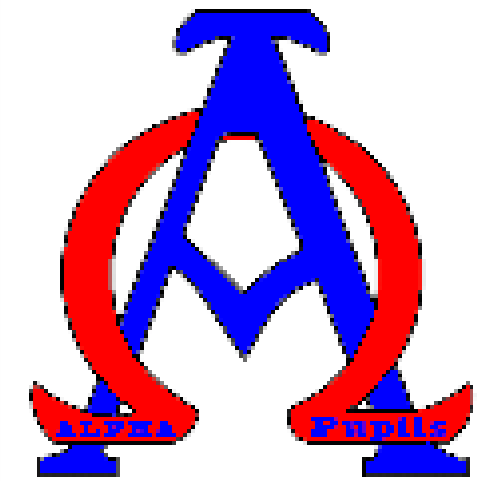

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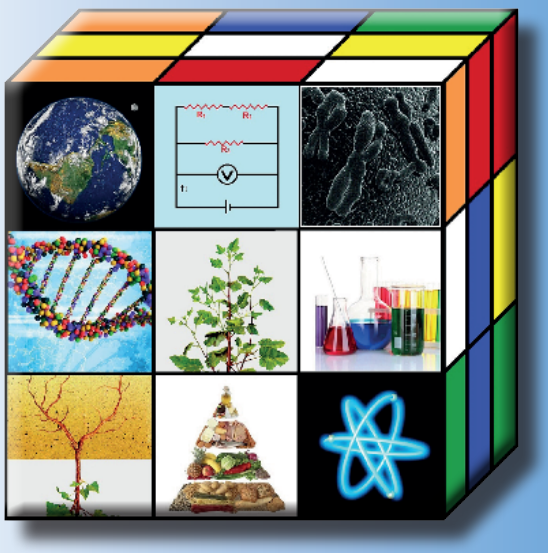

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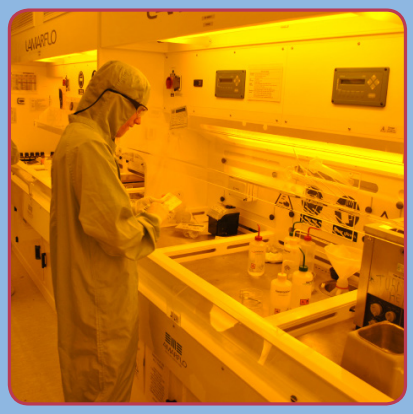

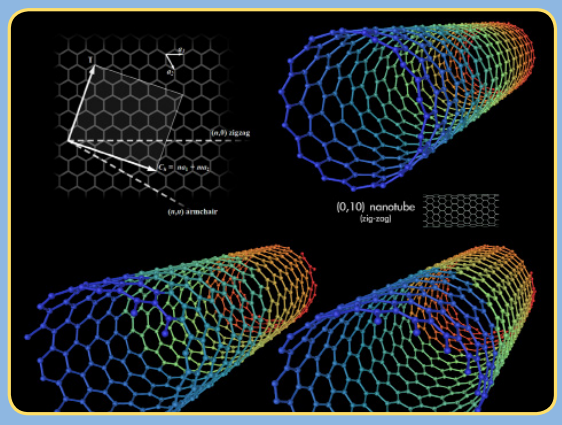

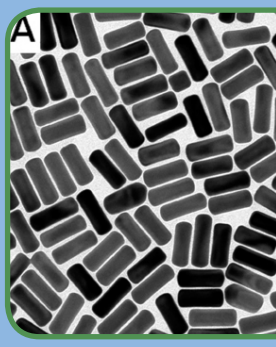

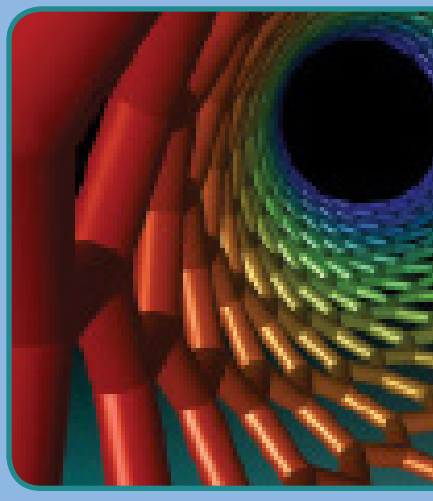

EDITORIAL

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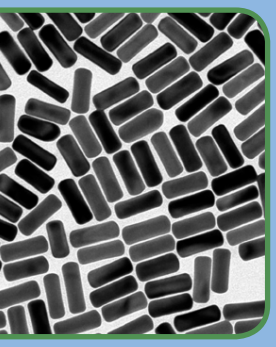

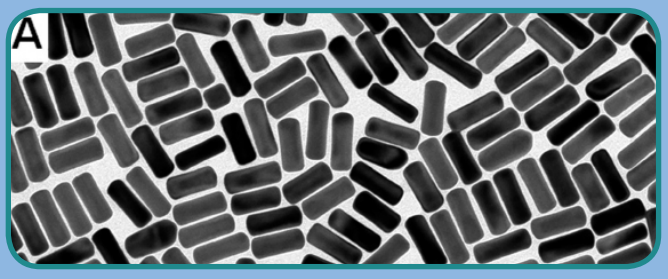

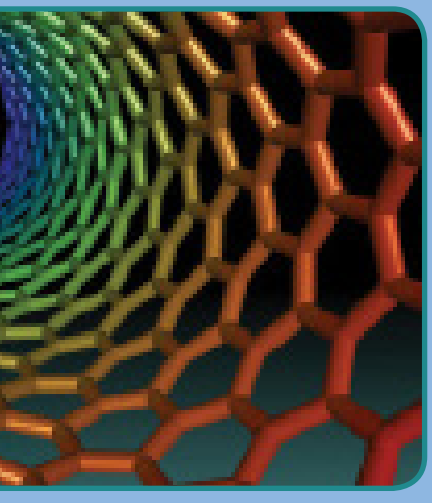

EN - Editorial

Tamara Slatineanu
Chemisty Teacher at Colegiul Tehnic G. Asachi, Iasi, Romania.

Nano*Technology* is a fact present in our day by day life. The good news is that Nanotechnology is not that modern, dating since Egyptian time. If we say Technology means to think more of the classical theories and products or devices which conducted to the world of Industrialization, while Nanotechnology is considered the era of quantum theories and atomic devices or products connected to the world of Communications and Informatics Technology.

In order to decrease the gap between the knowledge gained at school (books or classes) and the knowledge of real day by day world it is welcome to give to **Nano-*Technology*** space enough to be known by youth generation.

Under these arguments, **A.L.P.H.A. - Pupils** Comenius Bilateral Project (2013-1-RO1-COM07-29620 1) is bringing together two European schools with tradition in education (Colegiul Tehnic *Gheorghe Asachi* from Iaşi, Romania - Liceo *Boggio Lera* from Catania, Italy) and **European Pupils *Magazine*** community to share facts and ideas about **Nano*Technology***, the impact on our modern life, health, professional career and self-development. For more information about our project, please feel free to visit our web page http://alphapupils.colegiulasachi.ro/ and give us a feedback.

Let's leave pupils to show their brilliant team works as a good example to be followed…

Palatul Culturii , Iasi, Romania.

GR - Σημείωμα του εκδότη

Η **Νανοτεχνολογία** είναι ένα στοιχείο που εμφανίζεται στην καθημερινότητά μας. Τα καλά νέα είναι ότι η **Νανοτεχνολογία** δεν είναι τόσο μοντέρνα, αλλά χρονολογείται από την Αιγυπτιακή περίοδο.

Μιλώντας για Τεχνολογία σκεφτόμαστε περισσότερο τις κλασικές επιστημονικές θεωρίες και τα προϊόντα ή συσκευές που οδήγησαν στον κόσμο της Βιομηχανοποίησης, ενώ η **Νανοτεχνολογία** συνδέεται με την εποχή των κβαντικών θεωριών και των ατομικών συσκευών ή προϊόντων που συνδέονται με τον κόσμο των Επικοινωνιών και της Τεχνολογίας της Πληροφορικής.

Προκειμένου να μειωθεί το χάσμα μεταξύ της γνώσης που κερδήθηκε στο σχολείο και της τρέχουσας γνώσης στον κόσμο, είναι καλό να δοθεί στη **Νανοτεχνολογία**αρκετός χώρος για να γίνει γνωστή στη νέα γενιά.

Πάνω σ' συτό το σκεπτικό δύο ευρωπαϊκά σχολεία με παράδοση στην εκπαίδευση, το Colegiul Tehnic Gheorghe Asachi από το Ιάσιο της Ρουμανίας και το Liceo Boggio Lera από την Κατάνια της Ιταλίας, συνεργάζονται στο πλαίσιο του διμερούς μαθητικού προγράμματος ALPHA Comenius (2013-1-RO1-COM07-29620 1).

Με το συγκεκριμένο πρόγραμμα συνεργάζεται επιπλέον και η κοινότητα του Ευρωπαϊκού Μαθητικού Περιοδικού EPM. Στο πρόγραμμα οι εμπλεκόμενοι έχουν την ευκαιρία να μοιραστούν γεγονότα και ιδέες σχετικά με τη **Νανοτεχνολογία**, που αφορούν στις συνέπειες στην καθημερινότητα μας, στην υγεία, στην επαγγελματική καριέρα και στην προσωπική εξέλιξη του ατόμου.

Για περισσότερες πληροφορίες για το πρόγραμμά μας μπορείτε να επισκέπτεσθε την ιστοσελίδα μας http://alphapupils.colegiulasachi.ro/. Περιμένουμε την κριτική σας.

Ας αφήσουμε, λοιπόν, τους μαθητές να παρουσιάσουν την εξαιρετική δουλειά των ομάδων τους, η οποία μπορεί να λειτουργήσει ως λαμπρό παράδειγμα προς μίμηση.

Will nanocats fit in the bag?

Talking about the Magazine, Iasi's last meeting day.

BG - ЕРедакционно

Нанотехнологията е факт и присъства в нашия всекидневен живот. Добрата новина е, че нанотехнологиите не са толкова съвременни, тъй като датират от египетско време.

Когато казваме технология, това означава, че имаме предвид повече класическите теории и продукти или устройства, които водят към света на индустриализация, докато под **Нанотехнологията** се разбира ерата на квантовите теории и атомни устройства или продукти, свързани със света на технологиите в комуникациите и информатиката.

За да се намали несъответствието между знанията, придобити в училище (книги или класове) и всекидневните знания е добре да дадем на **Нанотехнологията** достатъчно място, за да се познават от младото поколение. При тези доводи, **A.L.P.H.A.** – Училищен двустранен проект Коменски (2013-1-RO1-COM07-29620 1) обединява две европейски училища с традиции в областта на образованието (Colegiul Tehnic Gheorghe Asachi от Яш, Румъния - Liceo Boggio Lera от Катания, Италия) и **Европейското Ученическо Списание** (EPM) общността да споделят факти и идеи за нанотехнологиите, въздействието върху нашия съвременен живот, здраве, професионална кариера и личностно развитие. За повече информация за нашия проект, моля не се колебайте да посетите нашата уеб страница http://alphapupils.colegiula-sachi.ro/ и да ни дадете обратна връзка.

Да оставим на учениците да покажат своите брилянтни екипни работи като добър пример за подражание

IT - Editoriale

Le **NanoTecnologie** ormai si presentano giorno per giorno nella nostra vita e, ultimamente, si è scoperto che non è neanche così recente, affondando le sue radici addirittura nell'antico Egitto.

Riflettendo sul significato del termine ***Tecnologia*** ci vengono in mente tutti i dispositivi che ci hanno condotto all'Industrializzazione mentre, pensando alle ***Nano-Tecnologie***, vengono in mente teorie quantistiche e dispositivi di dimensioni atomiche e, comunque, riguardano prodotti connessi al mondo della Comunicazione e della Tecnologia Informatica.

Oggigiorno, per ridurre il buco nero nella preparazione scolastica e la consapevolezza dei suoi reali sviluppi, è giusto dare alle **Nanotecnologie** ampio spazio per essere conosciuta dalle giovani generazioni. In quest'ottica, il progetto ***A.L.P.H.A. Pupils Comenius Bilateral Project*** (2013-1-RO1-COM07-29620 1) guida insieme due importanti (per tradizione e attività educativa) scuole Europee - Colegiul Tehnic **Gheorghe Asachi** di Iaşi, Romania e Liceo *E. Boggio Lera* di Catania, Italia - per documentare le tantissime idee, scoperte e possibilità di carriera che le **NanoTecnologie** odierne permettono, attraverso la grande e ricca community di **EP*Magazine***. Per maggiori informazioni riguardo il nostro progetto, potete visitare il sito web http://alphapupils.colegiulasachi.ro e darci un parere al riguardo.

Ora lasciamo spazio al brillante lavoro di gruppo dei nostri giovani!

Italian pupils before the meeting.

DE - Editorial

NanoTechnologie ist inzwischen aus unserem Alltag nicht mehr wegzudenken. Doch so wirklich neu ist die Nanotechnologie gar nicht, schon die alten Ägypter kannten sie.

Um die Lücke zwischen Schulwissen zu diesen Thema und der angewandten ***NanoTechnologie*** im Alltag zu schließen soll der jungen Generation das Thema näher gebracht werden.

Dazu haben sich zwei Schulen mit langer Bildungstradition, das Colegiul Tehnic Gheorghe Asachi aus Iaşi, RO und das Liceo Boggio Lera in Catania, IT mit dem **European Pupils *Magazine*** im Rahmen des bilateralen COMENIUS Projekts A.L.P.H.A. – Pupils (2013-1-RO1-COM07-29620 1) zusammengetan.

Ziel ist die Information der jungen Generation durch Schülen über Fakten und Trends der ***NanoTechnologie*** und ihrer Auswirkungen auf die Gesellschaft, die Berufs- und Arbeitswelt und unser persönliches Leben.

Informationen über das Projekt sind über http://alphapupils.colegiulasachi.ro/ abzurufen, Arbeiten von Schülerteams zum Thema ***NanoTechnologie*** lesen Sie in der vorliegenden Ausgabe des **European Pupils *Magazine***.

Working hard at the logo.

RO - Editorial

NanoTechnologia este prezentă zi de zi în viaţa noastră. Veste bună este că această tehnologie nu este chiar atât de modernă, ea existând încă din epoca înfloritoare a Egiptului antic.

Când spunem tehnologie suntem obişnuiţi să ne gândim la teoriile clasice ale fizicii sau mecanicii, la produsele sau instrumentele ce au dezvoltat Era Industrializării, pe când ***NanoTehnologia*** este considerată că aparţine Erei Teoriilor Cuantice şi a instrumentelor/produselor de dimensiune atomică sau subatomică din Era Comunicaţiilor şi a Tehnologiei Informaţiilor.

Pentru a depăşi distanţa dintre cunoaşterea dobândită în liceu şi cunoaşterea pe care se bazează era actuală, este binevenită atenţia acordată ***NanoTechnologiei*** astfel încât ea să fie accesibilă elevilor înainte de a deveni studenţi, angajaţi sau întreprinzători particulari.

În acest context, Proiectul Bilateral Comenius **A.L.P.H.A.–Pupils** (2013-1-RO1-COM07-29620 1) leagă două şcoli europene cu tradiţie în educaţie (Colegiul Tehnic Gheorghe Asachi din Iaşi, Romania - Liceo Boggio Lera din Catania, Italy) de comunitatea **European Pupils *Magazine*** pentru a împărtăşi fapte şi idei despre domenii ale ***NanoTechnologiei***, impactul acestora asupra lumii moderne, a sănătăţii, carierei şi dezvoltării personale a individului.

Pentru mai multe informaţii despre proiectul nostru, vă recomandăm să vizitaţi pagina web http://alphapupils.colegiulasachi.ro/ şi să ne oferiţi un feedback.

Să lăsăm elevilor să dezvăluie lucrările lor bazate pe minunatul efort de echipă, ca un bun exemplu demn de urmat…

Iulia Florea speaking at the videoconference before the meeting.

Liceo Statale
E. Boggio Lera
Catania, Italy

Colegiul Tehnic
Gheorghe Asachi
Iasi, Romania

State of the art for NanoParticles Design

Designul modern al nanoparticulelor

Bîrdan Georgiana, Temciuc Irina, Serena Bonanno

Introduction

Since the beginning of last century, nanotechnology has tried to imitate nature so as to achieve reproducible and multifunctional complex models to replace traditional materials. In 1915, W. Ostwald was the first who realized the interdependence between the nanoparticle's properties, size and shape. In the last two decades, researchers have attempted to obtain various nanodimensional structures in terms of shape, size or color and compatibility with the function and the environment for which they were created. Managing to obtain a very diversified design from a type of a nanoparticle to another, these need nomenclature and taxonomy.

The use of nanoparticles in practical areas revealed the need to obtain them and their characteristics: to have a high purity and uniform chemical compositions, their size falls within a narrow uniform distribution and are controllable, the shape and morphology of nanoparticles to be identical.

Introducere

Încă de la începutul secolului trecut, nanotehnologia a încercat să imite natura astfel încât să ajungă la modele reproductibile şi multifuncţonale complexe care să înlocuiască materialele clasice. În 1915, W. Ostwald a fost primul care a realizat interdependenţa la nivelul nanoparticulelor între proprietăţi, dimensiune şi formă. În ultimele două decenii, cercetătorii au avut tendinţa să obţină structuri nanodimensionale cât mai diverse, din punct de vedere al formei, mărimii sau chiar culorii, şi al compatibilităţii cu funcţia şi mediul pentru care au fost create. Obţinându-se un design foarte variat, de la o nanoparticulă la alta, acestea au avut nevoie de nomenclatură şi taxonomie.

Utilizarea nanoparticulelor în domenii practice a relevat necesitatea respectării unor cerinţe privind obţinerea şi caracteristicile acestora: să aibă o puritate înaltă şi compoziţii chimice unitare, mărimea lor să se înscrie într-o distribuţie uniformă îngustă şi să fie controlabilă, forma şi morfologia nanoparticulelor să fie identice.

Acest articol îşi propune să expună câteva aspecte privind tipologia designului nanoparticulelor de-a lungul timpului şi funcţionalitatea acestora, plecând de la metodele de sinteză şi parcurgând câteva clasificări consacrate ale nanomaterialelor.

Cercetarea rezultatelor recente

Procedeele de sinteză utilizate curent pentru obţinerea nanoparticulelor sunt cunoscute sub denumirile generice de "bottom up" şi "top-down"(Fig.1). Procedeele "top-down" – de la "mare" la "mic" (nano) – se realizează

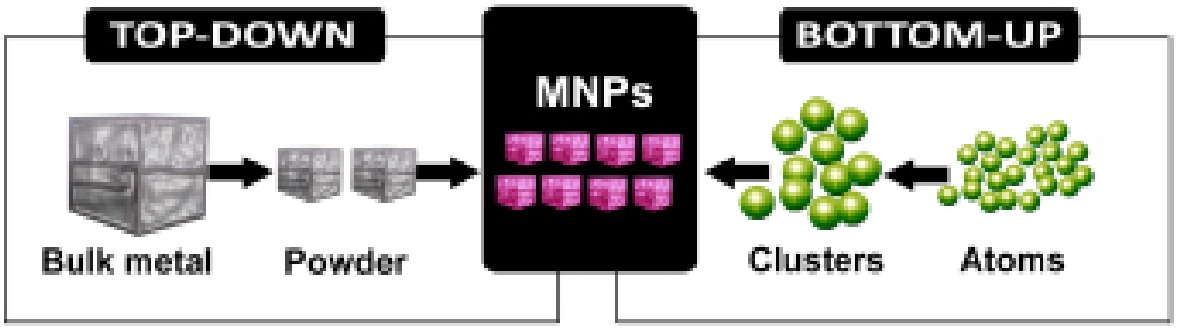

Fig. 1 Methods used to obtain nanoparticles

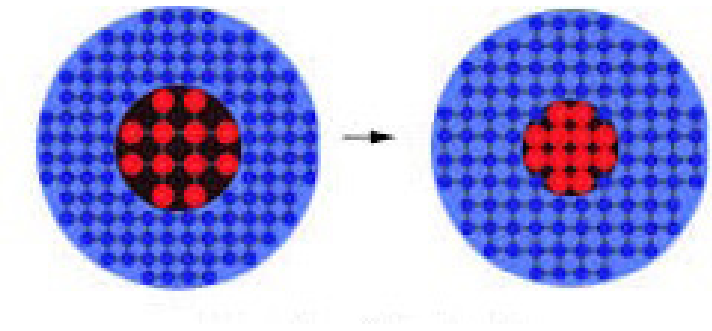

Fig. 2 Quantum dots

This article aims to expose some aspects on design typology nanoparticles over time and their functionality, based on the method of synthesis, covering several classifications of established nanomaterials.

Recent research & results

The methods currently used to obtain synthesis of nanoparticles are generally known under the generic names of "bottom up" and "top-down".(Fig.1) The method "top-down" – from obtain "high" to "low" (nano) are realized through the mechanical shredding or grinding, heating or repeated toughening, or with lithographic techniques. The "bottom up" procedures or self-assembly are more used in the synthesis of nanoparticles and in the development of many synthetic methods such as homogeneous nucleation of liquid and vapor, heterogeneous nucleation on substrates, etc. The wide variety of nanostructured materials, in terms of shape, size, dimensionality, chemical composition and uses imposed the necessity of their classification.

After their form, nanostructured materials are classified into several groups that are presented below. Quantum dots (Fig.2), quantum well are nanostructures which are represented by crystalline nanoparticles, with spherical or bucilar shape, extremely small (1-100), which represent a new type of semiconductor. The "Quantum dot" (quantum dot) notion was introduced for the first time in nanotechnology by scientists Hirozuki Sakaki and Zauhiho Arakawa, in 1982, with the implementation of the laser that was inspired by innovative technology. Quantum dot and quantum wells are nanostructures found today in integrated circuits (embedded systems). They have forms ranging from pyramids and cylinders (vertical dots) or are free powders, showing a spherical structure, referred to as nanocrystals.

prin mărunţire sau măcinare mecanică, prin încălziri şi căliri repetate sau prin tehnici litografice. Procedeele "bottom up" sau autoasamblarea sunt mult mai utilizate în sinteza nanoparticulelor şi stau la baza dezvoltării multor metode de sinteză cum ar fi nucleaţia omogenă din lichide şi vapori, nucleaţia eterogenă pe substraturi etc. Varietatea largă a materialelor nanostructurate, din punct de vedere al formei, mărimii, dimensionalităţii, compoziţiei chimice şi a utilizărilor a impus necesitatea clasificării lor.

După forma nanostructurilor, materialele nanostructurate se divid în câteva grupe care vor fi prezentate în cele ce urmează. Quantum dots (Fig.2), quantum well sunt nanostructuri reprezentate de nanoparticule cristaline, cu formă sferică sau cubică, extrem de mici (1-10 nm), care prezintă comportare cuantică şi sunt intens promovate ca un nou tip de semiconductori. Această noţiune de "Quantum dot" (punct cuantic) este introdusă pentru prima dată în nanotehnologie de către savanţii Hirozuki Sakaki si Zauhiho Arakawa, în 1982, odată cu implementarea laserului ce avea la bază această tehnologie inovativă. Quantum dots şi quantum wells sunt utilizate în circuitele integrate (embedded systems). Au forme ce variază de la piramide şi cilindri (vertical dots) până la forme plane (lateral dots) sau sunt liberi sub forme de pulberi, prezentând o structură sferică, fiind denumite

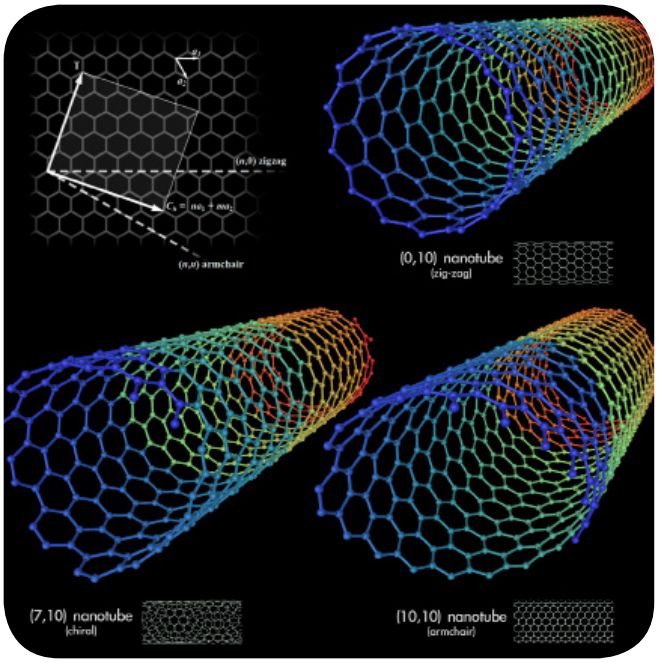

Fig.3 Carbon nanotubes

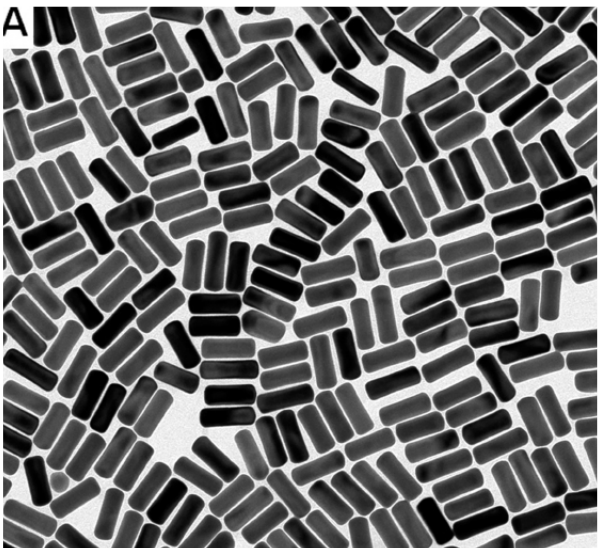

Fig. 4 Nanorods

Clusters and nanocrystals have sizes of 0,2 – 1 nm, and spherical form and have particular applicability in the field of semiconductors, catalysis and electrocatalysis (in fuel cells). The cluster concept was used for the first time by Robert Boyle in 1661, in his book: *The Sceptical Chymist* [2]. The term cluster is synonymous with the term "aggregate" which consists of a number N> 3 atoms or molecules, which may be the same, resulting in homo-atomic clusters or homo-molecular, or can be composed of two or more different particles leading to hetero-atomics clusters or hetero-molecular.

Depending on their chemical composition, clusters can be metallic or non-metallic. Nanotubes (Fig.3) - nanostructures that present a lumen of nanometric dimension and variable length, being useful in energy storage devices, sports clothing and shoes, water filters, etc. Nanorods (Fig.4) - nanostructures with form of filaments with nanoscale diameter and relatively higher length being applicable in hyperthermia for cancer treatment, in devices storing and emitting energy, in display technologies (display), etc. Nanowires (Fig.5)-represented in the form of nanofilament nanostructures with semiconductor properties. Nanostructured films – are very thin layers, coating, usually nature oxides, which are performing in the photocatalysts, sensors, biosensors and solar cells.

Richard W. Siegel classified nanomaterials after dimensionality 0D, 1D, 2D and 3D nanocristale. Clusterele şi nanocristalele au dimensiuni între 0,2 – 1 nm, fiind de formă sferică şi având aplicabilitate mai ales în domeniul semiconductorilor, cata-lizei şi electrocatalizei (în pile de combustie); pentru prima dată noţiunea de cluster a fost folosită de Robert Boyle, în 1661, în cartea sa ***The Sceptical Chymist*** [2]. Clusterele pot fi sinonime cu termenul de "agregat" format dintr-un număr N>3 atomi sau molecule, care pot fi identice, conducând la clustere homo-atomice sau homo-moleculare, sau pot fi diferite, conducând la clustere hetero-atomice sau hetero-moleculare. De asemenea, ele pot fi metalice sau nemetalice.

Nanotuburi (nanotubes) (Fig.3) – nanostructuri care prezintă un lumen de dimensiuni nanometrice şi lungime variabilă, fiind utile în dispozitive pentru stocarea energiei, îmbrăcăminte şi încălţăminte sportivă, filtre de apă, etc. Nanobare (Fig.4) – nanostructuri, având forma unor filamente cu diametru la scara nanometrică şi cu lungimi relativ mai mari, fiind aplicabile în hipertermie pentru tratarea cancerului, în dispozitive de stocare a energiei şi emitere a luminii, în tehnologii de afişare (display) etc. Nanofire (Fig.5) – reprezentate de nanostructuri, având forma unor nanofilamente cu proprietăţi semiconductoare.

Filme Nanostructurate – sunt straturi foarte fine, de acoperire, de obicei de natură oxidică, care sunt performante în domeniul fotocatalizatorilor, a senzorilor, biosenzorilor şi a celulelor solare.

Richard W. Siegel clasifică nanomateri-

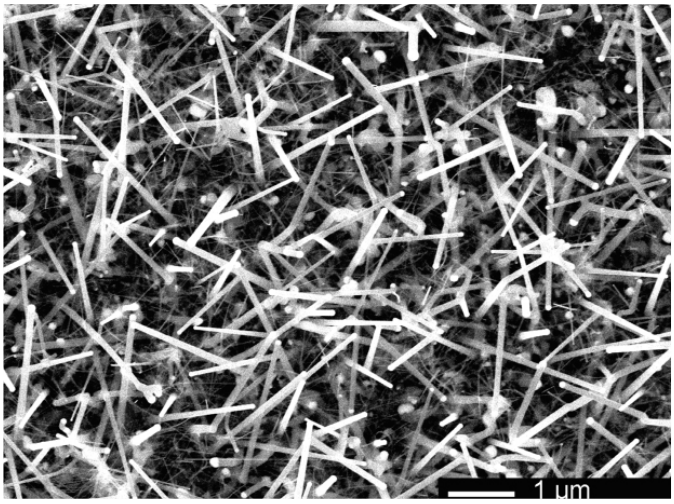

Fig. 5 Nanowires

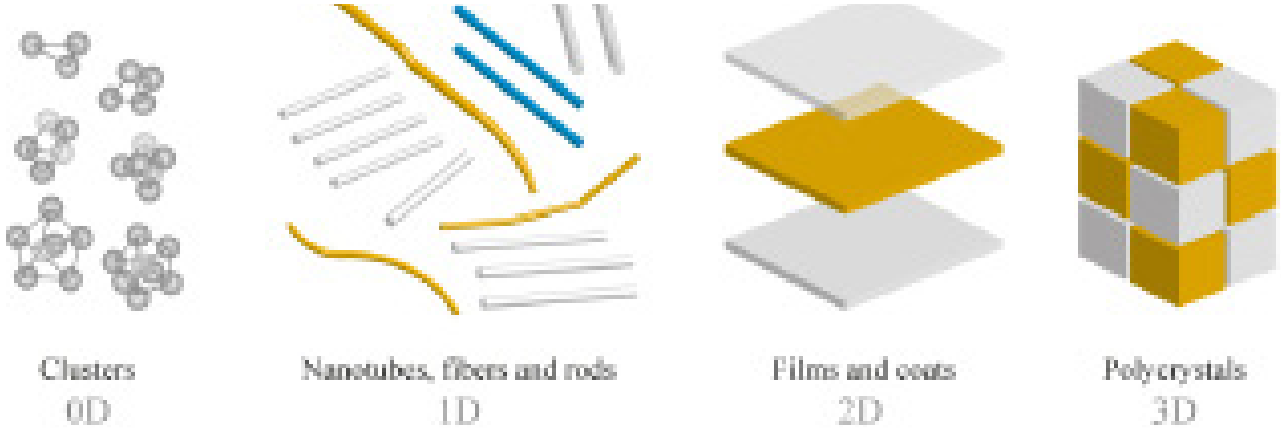

Fig. 6 Classification of nanomaterials

(Fig.6). For example 0D nanomaterials (zero dimensional) are represented by quantum dots, nanocluster, metal nanocrystallites (Pd, Pt, Au, Cu, Zn, Ni, Co, Rh) and semiconductor (ZnS, PbS, CdS) continuous nanostructures of atoms or molecules that possess all sizes in nanoscale; 1D nanomaterials (unidimensionale) are the ones that posses one size in nanoscale and are represented by nanostructures such as: nanofire: Au, Ag, Pt, Sn, Al, etc; nanochains and nanoribbons; nanobelts: ZnO (hexagonal), SnO_2 (rutile type), CdO (NaCl type structure), Ga_2O_3; carbon nanotubes with single wall, type MWCNT – carbon nanotubes with more walls.

Conclusions

Researches in nanotechnology are constantly evolving. The various shapes, sizes and structures of nanoparticles is a testament to modern market of requirements' materials. The properties exhibited by nanoscale materials include the information that contributes to achieving the goal, this being getting functional performance on a low scale with minimal costs, whether they be semiconductors, hyperthermia agents, magnetic materials, sensors, catalysts or photocatalysts. A number of regulations in this area focuses on environmental policy, toxicity or biocompatibility, elements that contribute to enhance people's lives.

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alele după dimensionalitate, şi anume, 0D, 1D, 2D şi 3D (Fig.6). De exemplu, nanomaterialele 0D (zero dimensionale) sunt reprezentate de quantum dots, nanoclustere, nanocristalite metalice (Pd, Pt, Au, Cu, Zn, Ni, Co, Rh) şi semiconductoare (ZnS, PbS, CdS) nanostructuri continue de atomi sau molecule, care posedă toate dimensiunile la scară nanometrică. Nanomaterialele 1D (unu dimensionale) sunt cele care posedă o singură dimensiune la scară nanometrică şi sunt reprezentate prin nanostructuri cum ar fi: nanowires: Au, Ag, Pt, Sn, Al etc; nanochains şi nanoribbons; nanobelts: ZnO (hexagonal), SnO2 (tip rutil), CdO (structura tip NaCl), Ga2O3; nanotuburi de carbon cu un singur perete, tip MWCNT – nanotuburi de carbon cu mai mulţi pereţi.

Concluzie

Cercetările în domeniul nanotehnologiei sunt în continuă evoluţie. Numeroasele forme, dimensiuni şi structuri ale nanoparticulelor reprezintă o mărturie a cerinţelor impuse de piaţa modernă a materialelor. Proprietăţile manifestate de materialele obţinute la scară nanometrică includ în sine informaţia ce contribuie la atingerea scopului, acesta fiind obţinerea performanţelor funcţionale la scară redusă şi cu costuri minime, fie că sunt semiconductori, agenţi de hipertermie, materiale magnetice, senzori, catalizatori sau fotocatalizatori. O serie de reglementări în domeniu pun accent pe politici de protecţie a mediului, toxicitate sau biocompatibilitate, elemente care să contribuie la creşterea calităţii vieţii oamenilor în viitor.

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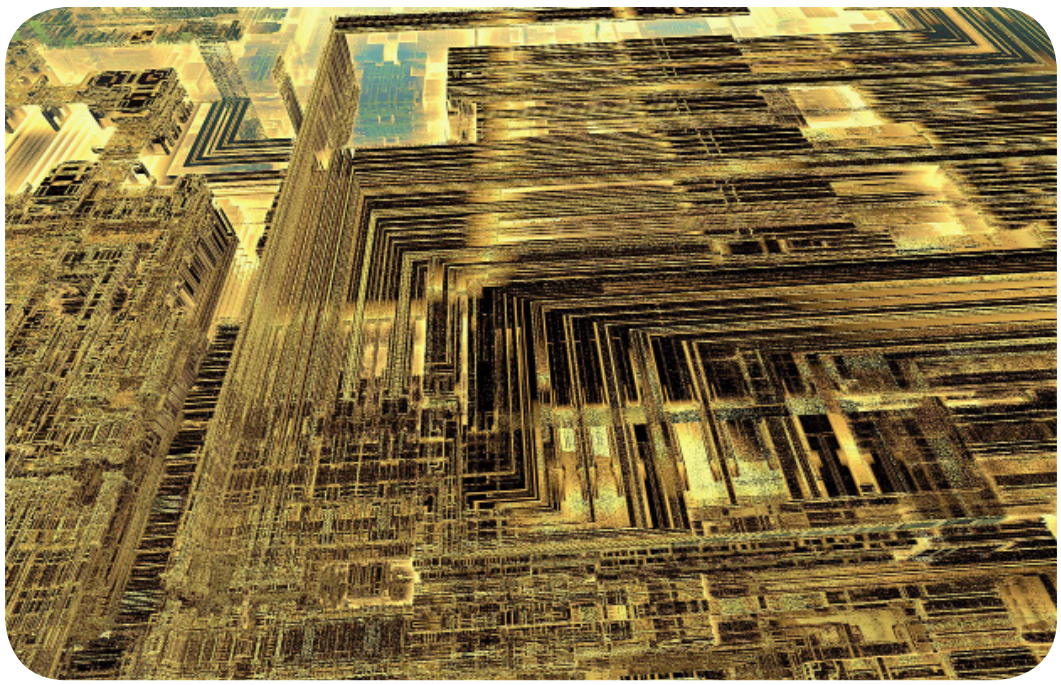
We warmly thank Tamara Slatineanu and other Romanian teachers for their support.



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Nanotechnology: Advantages and disadvantages

Nanotecnologia: Vantaggi e svantaggi

Marco Reale, Daniele Rinaldi, Mirela Ioana Astefanei

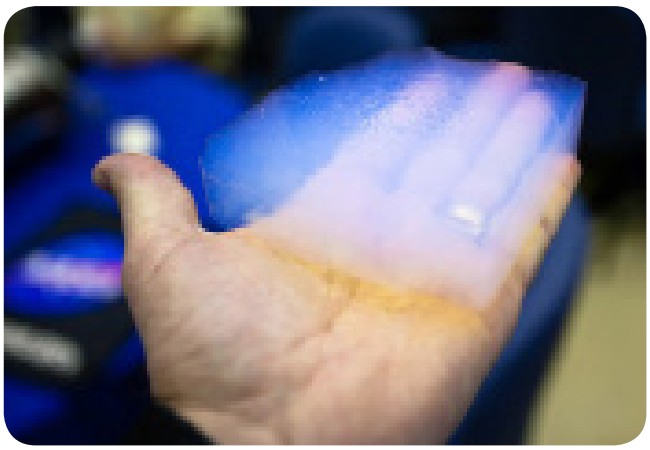

Fig. 1 Aerogel, one of the lightest material ever created

Introduction

Nanotechnology is a revolutionary scientific field, specialized in the manipulation of matter. This science should not be underestimated, because every time a new technology is developed society, as we know it, could change. By developing this branch of science, our lives could get better or even worse; it depends on how we use it. Nanotechnology is a wager and the consequences that it could bring to humanity are often unpredictable. The aim of this research is to analyse each field of nanotechnology and, if there are any, spot the advantages and disadvantages. Our analysis is meant to warn from any possible risk deriving from this kind of technology and to inform about their useful applications.

Fig. 2 Scientists working in a nanotech center.

Manufacturing

One of the most important things to know about nanotechnologies is that it is possible

Introduzione

La nanotocnologia è un rivoluzionario campo scientifico specializzato nella manipolazione della materia.Questa scienza costituisce una scommessa per il futuro e non deve essere sottovalutata per le importanti conseguenze che potrebbe avere per lo sviluppo della società per il miglioramento della vita umana. Lo scopo di questa ricerca è quello di analizzare ogni campo della nanotecnologia e nel caso ce ne siano, individuarne i vantaggi e gli svantaggi. Essa punta a sottolineare i possibili rischi provenienti da questa tecnologia e ad informare per conoscere le sue utili applicazioni.

Industria

Uno degli aspetti più importanti delle nanotecnologie è la possibilità di creare materiali più efficienti con caratteristiche utilissime. Le principali proprietà dei nanomateriali sono:

- forza;
- leggerezza;
- duttilità;
- dimensioni estremamente ridotte (109 m);
- conduttibilità di calore ed elettricità;
- idro-repellenza

Grafene e nanotubi di carbonio sono entrambi nanostrutture basate sul carbonio, molto sottili (dello spessore di qualche atomo) ma comunque molto resistenti, circa 200 volte più forti dell'acciaio. Con questi nuovi materiali ogni campo dell' industria verrà rivoluzionato. Ci sono alcuni problemi nell'utilizzo di queste tecnologie nei processi industriali perché produrre nanostrutture è molto costoso e difficile.

Fig. 3 A Solar powered boat.

to create more efficient materials with very useful characteristics. The main properties of nanomaterials are:

- strength;
- lightness;
- ductility;
- extreme small size (10^9 m);
- Thermal and electrical conductibility;
- Water repellency

Graphene and Carbon Nanotubes are both nanostructures based on carbon, they are very thin (just a few atoms' width) but still very strong, (about 200 times stronger than steel). With these new materials each field of industries will be revolutionized. There are some problems with the implementation of these technologies in manufacturing processes. Producing nanostructures is very expensive and also very difficult. Thus, nanomaterials are not going to be in our lives very soon, unless they become cheaper.

Energy

Nowadays' society is becoming more and more dependent on energy of all kinds although it is increasingly difficult to obtain it. There certainly are alternatives through which nanotechnology could create more efficient and cheaper energy:

For instance, fuel cells could be potentiated to produce more energy from hydrogen, making them a valid alternative:

- solar cells could become smaller and more efficient.
- quantum solar dots, for example, are a new kind of solar cells that in the next future will be cheaper. They are flexible and have a 65% efficiency (while common solar cells have from 13% to 20% efficiency).

Anche se alcune compagnie dovessero produrre nanostrutture, probabilmente avranno un costo elevato. Perciò, i nanomateriali non faranno parte delle nostre vite molto presto.

Energia

La società di oggi sta diventando sempre più dipendente da ogni tipo di energia anche se cresce la difficoltà ad ottenerla. La nanotecnologia potrebbe costituire una valida alternativa. Per esempio, le celle a combustibile potrebbero essere potenziate per produrre più energia dall'idrogeno (rendendole un'alternativa valida):

- Le celle solari potrebbero diventare più piccole e anche più produttive
- I punti solari quantici, per esempio, sono una nuova tipologia di celle solari e in futuro saranno più accessibili. Essi sono più flessibili, con un'efficienza energetica al 65% (mentre le comuni celle solari hanno un efficienza tra il 13% e il 20%).

Medicina

La nanotecnologia ha amche una grande influenza sulla medicina. Ci sono miglioramenti possibili in quasi tutti i campi medici:

- diagnosi;
- sistema di rilascio dei farmaci;
- terapie.

Con la nanotecnologia diventerà possibile:

- manipolare il DNA dannegiato e curare malattie genetiche;
- servirsi di nanorobot che si muovono all'interno del nostro corpo, capaci di diagnosticare qualsiasi tipo di malattia;

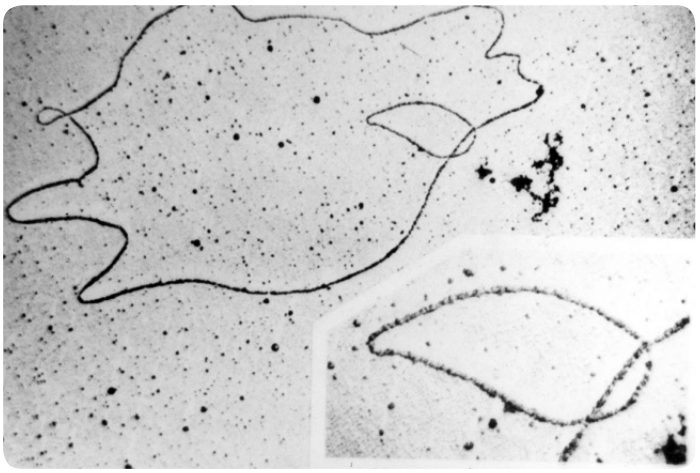

Fig. 4 DNA seen at electron microscope.

Medicine

Nanotechnology has also a big influence on medicine.

There are a lot of possible enhancements in nearly all fields of medicine:

- diagnosis;
- drug delivery system;
- therapies.

With nanotechnology it will be possible:

- to manipulate damaged DNA and cure genetic diseases;
- to have nanorobots travelling inside our body that diagnose any type of disease and to have nanostars that deliver the drug in the affected area once the disease is identified;
- to have nanofibers that can be used in wound dressings and surgical textiles.

However, even here there are some drawbacks. Using nanotechnologies for health care could be dangerous, because there is not enough information about the consequences that these could have on the human body. Nanotechnology exploits fibers and particles which may remain floating in the air and in that case they could be very damaging. It is well known that it is very dangerous to inhale nanoparticles, but there is not enough information about their ingestion.

Food industries are using nanotechnology more and more to improve the nutrients in their products. This more frequent use could be dangerous, because nanoparticles could react with elements that are already in the human body and generate toxins.

Warfare

This is a very serious issue that could have important impacts in our society and political system. People should think about the effects that this kind of technology could have on the military field:

- better weapons;
- better vehicles;
- better robots and drones;
- high-tech battle suits (bullet-proof, capable of monitoring health and communicating and receiving info);
- micro-fusion nuclear weapons;
- new chemical agents carried by nanoparticles;
- new security systems: smaller and more ef-

- avere “nanostelle” che rilasciano il medicinale nella zona infetta una volta che la malattia viene identificata; avere delle nanofibre che possono essere usate nei bendaggi chirurgici.

Tuttavia, anche qui vi sono delle complicazioni. Usare la nanotecnologia per la sanità potrebbe risultare pericoloso, perché non ci sono abbastanza informazioni riguardo alle conseguenze che queste potrebbero avere sul corpo umano. La nanotecnologia sfrutta fibre e particelle che rimarrebbero in sospensione nell’aria (in quel caso comporterebbero un rischio per la salute). È risaputo che è molto pericoloso inalare nanoparticelle, ma non ci sono abbastanza informazioni riguardo alle conseguenze di una loro ingestione.

Le industrie alimentari utilizzano sempre più le nanotecnologie per migliorare i nutrienti nei lori prodotti. Quest’uso frequente ha dei rischi, dato che le nanoparticelle potrebbero reagire con degli elementi già presenti nel corpo umano e generare tossine.

Settore militare

Questa è una questione molto seria che porterebbe ad importanti risvolti nel nostro sistema politico e sociale. Le persone dovrebbero pensare alle conseguenze che questa nuovo tecnologia causerebbe al campo militare:

- armi migliori;
- veicoli più efficienti;
- droni e robot più validi;
- tute high- tech (a prova di proeittile, capaci di monitorare la salute, capaci di comunicare e di ricevere informazioni);

Fig. 5 A military drone.

ficient;
- self-replicant biological agents.

It may soon be possible in the future to improve camouflage in a way no one would ever have imagined in the past. Scientists are studying a structure capable of diverting microwaves and in the future it will even be possible to divert light, making objects invisible.

Developing this kind of technologies could be risky: having better weapons means more destruction and more destruction means tougher wars. The consequences could be massive. Biological weapons could be enormously enhanced, and so could the atomic ones. Since the number of nations that implement nanotechnology in the armies is increasing, its use must be regulated. Nowadays, there is no international treaty that regulates the use of nanotechnology in weapons.

Environment

Today, we look at the environment, trying to respect it and take care of it; still, our impact on it is very strong. We can use nanotechnology in many ways to protect the environment, for instance:
- better catalysts that produce less pollution can be built;
- oil spills can be removed.

Unfortunately, we do not know how nanoparticles coming from other sectors, like industry, would affect the environment.

Conclusion

Our future depends on the way these technologies are implemented; that is why people should act responsibly when using them. In order to improve the possible advantages, governments need to invest more on research. Disadvanteges can be avoided by creating rules about the use of nanotechnology and every nation or company should use them responsibly and with the respect of the environment and people's health.

In the end, we can surely maintain that nanotechnology is neither good nor bad in itself but, if correctly exploited, it can definitely improve the life quality of the future generations.

Fig. 6 Oil spills burning in the sea

- armi nucleari a micro-fusione;
- nuovi agenti chimici grazie alle nanoparticelle;
- nuovi sistemi di sicurezza più piccoli e più efficienti;
- agenti biologici auto-replicanti.

Sarà inoltre possibile migliorare la mimetizzazione in un modo che nessuno avrebbe mai immaginato in passato. Gli scienziati stanno studiando strutture capaci di deviare le microonde cosicché si arriverà al punto di deviare la luce, rendendo gli oggetti invisibili.Sviluppare queste tecnologie è rischioso: avere armi migliori porterebbe a guerre più violonte. Le armi biologiche potrebbero fortemente potenziate e allo stesso modo quelle atomiche. Dato che il numero di nazioni che implementano le nanotecnolgie nel campo militare sta aumentando, è necessario che il loro utilizzo sia regolamentato. Ad oggi non c'è nessun trattato internazionale che regola l'uso delle nanotecnologie nelle armi.

Ambiente

Oggi si guarda all'ambiente cercando di rispettarlo e prendersene cura; nonostanto ciò, il nostro impatto su esso è significativo. Le nanotecnologie possono proteggerlo in diversi modi, per esempio:
- possono essere costruite migliori marmitte meno inquinanti;
- possono essere rimossi residui di petrolio.

Purtroppo, non sappiamo come le nanoparticelle provenienti da altri settori potrebbero influenzare l'ambiente.

Conclusione

Il nostro futuro dipende dal modo in cui queste tecnologie verranno utilizzate (per

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questo le persone dovrebbero agire con parsimonia utilizzandole). Per migliorarne i vantaggi, i governi dovrbebero investire maggiormente sulla ricerca. Gli svantaggi, invece, possono essere evitati con una regolamentazione che ne circoscriva l'utilizzo e con l'uso responsabile di ogni nazione o compagnia, nel rispetto dell'ambiente e della salute delle persone. Infine, è possibile stabilire che la nanotecnologia non è nè giusta nè sbagliata in sè, ma, se correttamente sfruttata, può di certo migliorare la qualità della vita delle future generazioni.

Green Energy - lunamense http://lunamense.deviantart.com/art/Green-Energy-89879272

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Nanoscience in fiction vs. fiction in nanoscience

Iulia Florea, Federica Di Domenico, Angela Vittorio

Notes of the autors

Before dealing with the topic nanotechnology and, particularly, the issue of nanotechnology in Science-Fiction, we want to emphasize that everyone has one's own point of view on everything; therefore, each of us faces or intends something in a different way from someone else. This happened when the Italian and the Romanian authors compared the ideas for proceeding and developing the topic. We have tried in many ways to combine our thoughts and, after a very long and fruitful confrontation, we faced this issue maintaining the different points of view and ways of thinking different to each other, even if conflicting sometimes. That's why, rather than asserting an idea at the expense of another, we preferred to work on both ideas, so to give an opportunity to the reader to choose in his opinion which was the more inspired way from the starting topic.

Enjoy your reading and, if you wish, you are welcome to send the authors your thoughts about their work and mainly our decision to show both versions of the same topic.

Nano science in fiction

Introduction

"Thinking small": this is the starting point of our research. Nanotechnologies and nanomaterials are already in common usage and in the objects we use every day. Many innovations achieved in the automotive sector, electronics, medicine and building materials would not have been possible without the use of nanotechnologies. And the potential that they offer in the near future is immense: development of new methods to improve the

Per trattare il tema delle nanotecnologie, con particolarità sull'argomento nanotecnologie nelle science fiction, vogliamo evidenziare l'importanza della soggettività. Ciascuno di noi ha una propria interpretazione della realtà circostante; abbiamo provato più volte a miscelare i nostri punti di vista, ma alla fine, dopo numerosi confronti e combattimenti, abbiamo deciso di mantenere ciascuno la propria visione. Noi autori dell'articolo, ci siamo resi conto di questa realtà nell'esatto momento in cui ci siamo incontrati per sviluppare questo topic. Così lasciamo al lettore l'opportunità di scegliere quale delle due interpretazioni rispecchi a pieno il topic.

Godetevi questa lettura e saremo felici di ricevere i vostri commenti.

Gli autori.

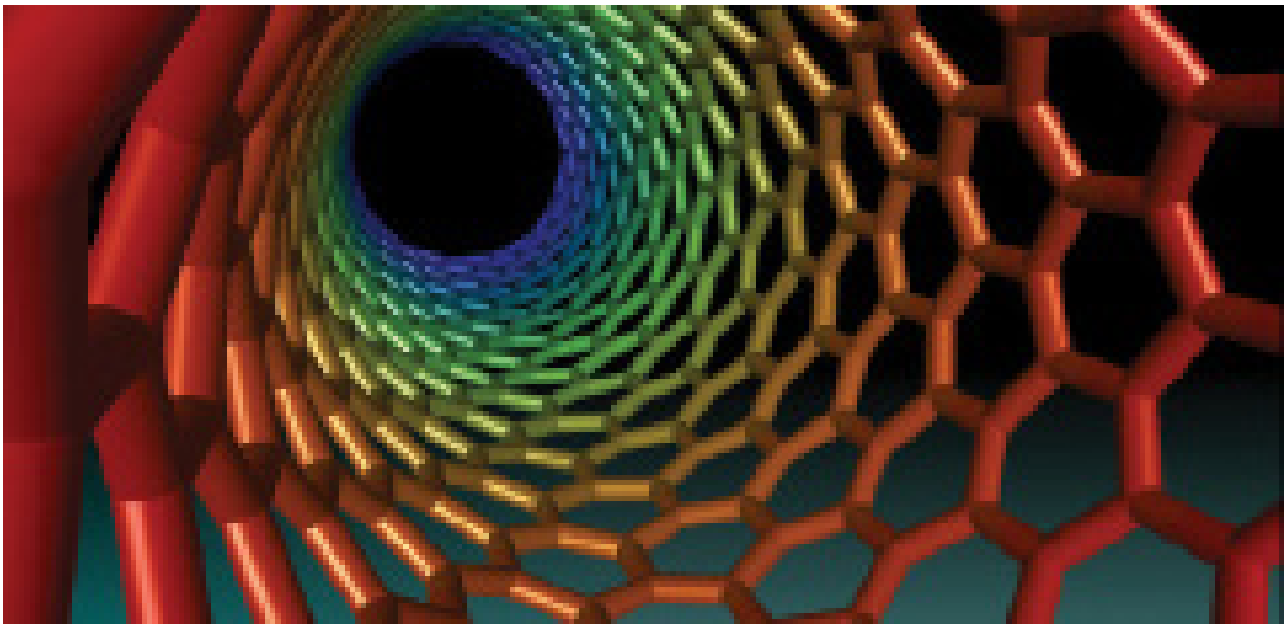
Nano science in fiction

Introduzione

"Pensare in piccolo": questo è il punto di partenza della nostra ricerca. Le nanotecnologie e i nanomateriali sono entrati già da tempo nelle applicazioni di uso comune e negli oggetti che usiamo tutti i giorni. Molte innovazioni raggiunte nel settore dell'automotive, dell'elettronica, della medicina e nei materiali da costruzione non sarebbero state possibili senza l'impiego delle nanotecnologie. E il potenziale che offrono nell'immediato futuro è immenso: sviluppo di nuovi metodi per migliorare il rilascio dei farmaci, elementi fotovoltaici ad altissimo rendimento, materiali intelligenti per l'accumulo di energia, batterie al litio più efficienti e di lunga durata.

Potremmo pensare: "Le nanotecnologie sono una realtà troppo lontana dalla nostra", Ma questo non è corretto. Come dimostrato la nanotecnologia è una realtà che ci appartiene da sempre. Siete ancora dubbiosi? Pensate, ad esempio, alla coppa di Licurgo, un tipo di coppa diatreta in vetro risalente all'epoca romana (IV secolo). Il vetro della coppa presenta piccole quantità di nano particelle di oro e argento, per questo cambia colore in base alla direzione della luce che lo colpisce. Questo effetto è detto dicroico.

Inoltre esse sono presenti in natura: l'esempio perfetto è dato dalle zampette del geco. Esse hanno pieghe ricoperte da migliaia di setole filiformi a loro volta formate da



release of drugs, photovoltaic elements with high efficiency, intelligent materials for energy storage, lithium batteries more efficient and long-lasting.

We may think: “nanotechnologies are a reality too far from our”, But this is incorrect. As nanotechnology is a reality that belongs to us forever. You are still doubters? Think, for example, the Lycurgus Cup, a type of glass cage Cup dating back to the Roman period (4th century). The glass has small amounts of nano particles of gold and silver, for this changes color depending on the direction of the light that strikes it. This effect is called dichroic.

In addition, they are found in nature: the perfect example is given by the feet of the Gecko. They have folds covered by thousands of filiform setae themselves consist of hundreds of microscopic strands of keratin soaked to flout the gravity and remain attached to any surface.

The researchers want to create sticky substances that, like Gecko’s paws, adhere to smooth surfaces.

In human history, the fantasies on nanotechnology have influenced a multitude of fields: literature, philosophy, art, motion pictures, video games, etc.

The idea of something so minute that manages to achieve all that we always have whetted the collective imagination.

Aims

The main goal is to find those sources

centinaia di filamenti microscopici imbevuti di cheratina che permettono di beffarsi della gravità e rimanere attaccati a qualunque superficie.

I ricercatori vogliono realizzare sostanze adesive che, come le zampe del geco, aderiscano a superfici lisce.

Nella storia umana, le fantasie sulla nanotecnologia hanno influenzato una moltitudine di campi: letteratura, filosofia, arte, cinematografia, videogiochi e via dicendo.

L’idea di qualcosa di così minuto che riesca a realizzare tutto ciò che noi desideriamo ha sempre stuzzicato l’immaginario collettivo.

Obiettivi

L’obiettivo principale è trovare quelle fonti strettamente connesse all’ambito dell’immaginazione e della fantasia che sono fonte di ispirazione per i grandi uomini di scienza che hanno contribuito con le loro creazioni alla crescita di tutta l’umanità .

Sorgono dunque spontanee delle domanda: ancora prima che la tecnologia esistesse, uomini illustri del passato riuscivano ad immaginare realtà che solo oggi ci appartengono? Le nanotecnologie sono una di questa? Come potevano pensare a qualcosa di tanto impensabile e distante?

Metodi E Materiali

In ordine cronologico attraverso un’accurata ricerca abbiamo scoperto che gli autori del passato hanno introdotto l’argomento.

closely connected to the scope of imagination and fantasy that are a source of inspiration to the great men of science who contributed with their creations to the growth of all mankind.

Hence arise the question: wild even before the technology existed, illustrious men of the past were able to imagine reality that only belong to us today? Nanotechnologies are one of this? How could they think of something so unimaginable and distant?

Method And Materials

In chronological order through a thorough research we discovered that the authors of the past have introduced the topic.

We present a list of the authors who inspired us:

Nanotechnology In Literature

In the past, the philosopher Democritus 460 (B.C. – 370 A.D.) talked about atoms, but

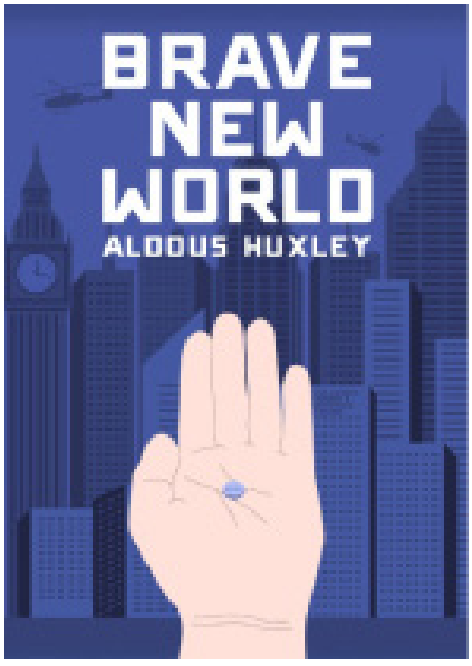


Fig. 2 A Brave New World manifest

nowadays we are in front of a new cultural revolution which permits scientist to manipulate atoms, molecules and agglomerates to build infinitely minute tools.

Francis Bacon – The New Atlantis

The first who spoke of nanotechnology was Francis Bacon (1561-1626). He wrote new Atlantis, describing a hypothetical science Island, inhabited by scientists of great

Fig. 1 The new Atlantis model

Vi presentiamo una lista degli autori che ci hanno ispirato:

Nanotecnologia nella letteratura

In passato il filosofo Democrito (B.C. – 370 A.D.) parlò di atomi, ma ora assistiamo a una rivoluzione culturale concreta, che permette agli scienziati di manipolare atomi, molecole e agglomerati per costruire strumenti infinitamente minuti.

Francis Bacon – La Nuova Atlantide

Il primo che parlò di nanotecnologia fu Francis Bacon (1561-1626). Egli scrisse La Nuova Atlantide, descrivendo un'ipotetica isola della scienza, abitata da scienziati di grande ingegno. Qui gli uomini eseguono ricerche ed esperimenti d'ogni genere: clonazione, ibernazione, trapianti e creazione di nuovi materiali con l'aiuto delle nanotecnologie. "La Nuova Atlantide" precede le fiction fantascientifiche. Generalmente si tratta di utopie e distopie che descrivono l'influenza delle scienze odierne o future sulla società.

Aldous Huxley – Il Mondo Nuovo

Lo scrittore inglese Aldous Huxley (1894-1963) nel suo Il Nuovo Mondo descrive un mondo futuristico. Ogni cittadino viene concepito in provette etichettate che determineranno il ruolo dell'individuo nella società. Ogni cittadino è controllato tramite nane camere nascoste ovunque. In questo mondo le nanotecnologie sono usate per il controllo mentale.

ingenuity. Here men perform research and experiments of all kinds: cloning, hibernation, transplants and creation of new materials with the help of nanotechnology. “The New Atlantis” precedes the Sci-Fi fiction. Generally these are utopias and dystopias that describe the influence of today’s or future science on society.

Aldous Huxley – Brave New World

The British writer Aldous Huxley (1894-1963) in his “Brave New World”describes a future world where every citizen is conceived in a test tube and is controlled with the help of nanotechnology because, when he becomes an adult, he will have a determined role since his birth. In this world, nanotechnology is used to control every mind.

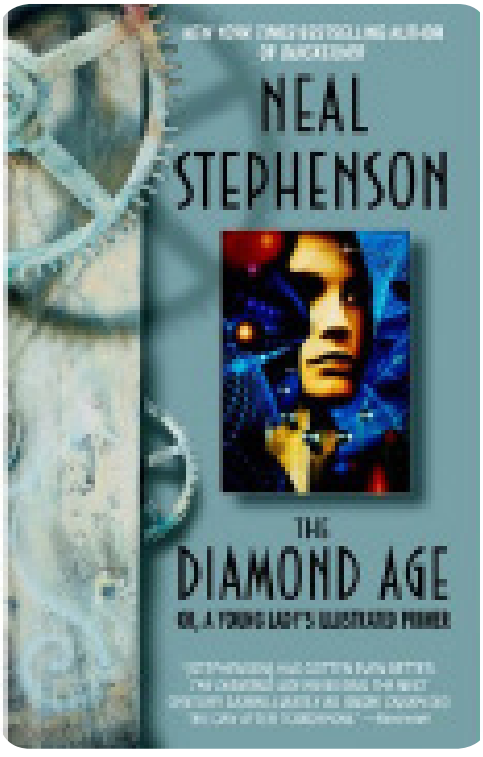


Fig. 4 The Diamond Age’s book cover.

Aldous Huxley – The New World

The English writer Aldous Huxley (1894-1963) in his new world describes a futuristic world. Every citizen is conceived in test tubes labeled that will determine the role of the individual in society. Every citizen is controlled via room hidden dwarfs anywhere. In this world the nanotechnologies are used for mind control.

Fig. 3 A 1984’s Manifest. A person who is spying with a micro camera.

George Orwell - 1984

Ispirato da lui, George Orwell (1903-1950) scrisse 1984, una distopia in cui il mondo è diviso in tre grandi stati. Il Grande Fratello, l’antagonista, controlla il mondo intero con l’aiuto di micro telecamere che spiano la vita di ogni persona.

Michael Crichton - Preda

Nel 2002 Michael Crichton (1984-2008) scrisse Preda: in un desolato luogo in America, una nuvola di nane particelle, micro robot, è scappata da un laboratorio. Essi sono stati programmati per essere predatori e distruggere tutto ciò che incontrano nel loro cammino.

Neal Stephenson – L’età Di Diamante

Il migliore esempio di nanotecnologie in ambito letterario è dato dal libro L’era di diamante di Neal Stephenson. Nella Shangai del XXI secolo, la nanotecnologia influenza ogni singolo aspetto della vita comune. La protagonista è una ragazzina, Nell. Le nanotecnologie sono alla base del romanzo, poiché sono usate per creare ogni genere di oggetto, e quasi ogni tipo di materiale può essere realizzato a buon mercato ed in grande quantità usando un compilatore di materia, che ricrea anche i diamanti. Questo permette di costruire innovativi progetti architettonici. Le città impiegano anche piccola macchina nanotecnologiche per scopi difensivi. Quando la scarsità materiale svanisce, nuovi fattori economici e culturali emergono per creare altri tipi di scarsità.

Michael Crichton - Prey

In 2002, Michael Crichton (1984-2008) wrote “Prey”: In an isolated place in America, a cloud of nanoparticles, micro-robots, have escaped from the laboratory. They were programmed to be predator, so they have destroyed all they met.

Neal Stephenson – The Diamond Age

However, I think the best expression of nanotechnology is the book “The diamond age” by Neal Stephenson. In the twenty-first century Shanghai, nanotechnology influences every aspect of life. The protagonist is a young girl, Nell. Nanotechnology is prominently featured in the novel, it is used to create the material, the only one used for each object and almost any material can be manufactured cheaply in large quantities using a matter compiler, including diamonds, which allows for groundbreaking architectural designs and construction results. Cities also employ tiny nanotech machines for defensive purposes.When material scarcity vanishes, new economic and cultural factors emerge to create other types of scarcity.

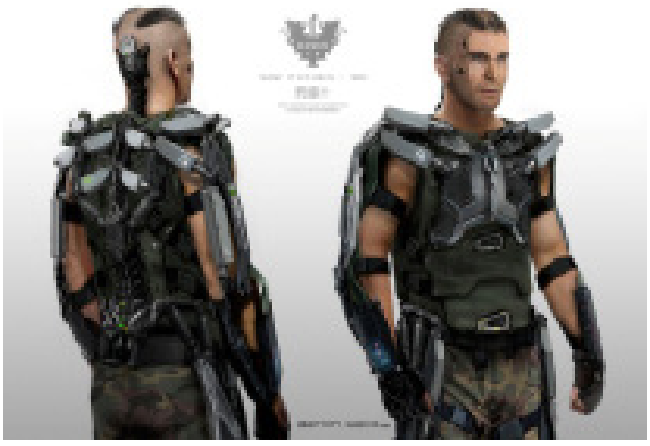


Fig. 6 The main character, Max wears his graphene suit

Nanotechnology In Cinema And Video Games

The world of cinema shows us all the possible uses of science and knowledge we have about it.

Fantastic Voyage

A “fantastic” example of nanotechnologies is “Fantastic Voyage”, made in 1996. Here a

Fig. 5 The micro submarine inside the blood.

Nanotecnologia nel cinema e nei videogiochi

Il mondo del cinema ci mostra tutti i possibili impieghi della scienza.

Fantastic Voyage

Un fantastico esempio di nanotecnologie è Viaggio Allucinante, realizzato nel 1996. Una squadra di medici è rimpicciolita, s’imbarca su di un micro sottomarino iniettato all’interno del corpo di uno scienziato per rimuovere un terribile ematoma cerebrale. È strano? Immaginate di poter, un giorno, andare in una farmacia non per comprare farmaci, bensì per acquistare una piccola fialetta di nano robot che inietterete nel corpo, ed essi vi cureranno. Il tutto sarà monitorato, grazie ad uno schermo collegato ai nano robot, così da poter acquisire nuove nozioni riguardo il nostro corpo. Perché no?

Elysium

Immagina il futuro. Riusciresti a vivere su un pianeta privo di natura, libertà e felicità?

Quando la Terra diventerà un luogo non più abitabile, gli scienziati potrebbero creare un pianeta artificiale per l’intera popolazione. Elysium è uno di questi. Qui troviamo tutta la tecnologia che permette all’uomo di poter cambiare la propria vita e di curare ogni malattia, proprio per questo Max, il protagonista, intraprenderà il viaggio verso il pianeta della salvezza. Su Elysium è possibile curare varie malattie grazie a dei macchinari chiamati capsule funzionanti tramite microchip fusi nel codice genetico degli uomini. Questi microchip permettono alle capsule di riconoscere il tipo di malattia e curarla.

physician equipe is made smaller, embarked on a micro submarine and injected in the body of a scientist to remove fro mhim a cerebral hematoma. Is it strange? We can imagine one day we will go in a drug store and we will not buy medicine, but a tin full of nano-robots that we inject in our body and they will cure us, and we will see our internal status thanks to a screen over us… and we will learn something about our body. Why not?

Elysium

Imagine the future. Can you think the Earth without green parks and trees, freedom and happiness?

When the Earth is no longer habitable, scientists could create an artificial planet for everybody.

Elysium is an artificial planet built by scientists. Here is all the technology able to change man´s life and cure all kind of disease. On Elysium, illnesses are easily curable thanks to machines called ˝capsule˝ functioning with microchips fused in people´s genetic code.

Fig. 8 A scene from the game

This microchip permits the capsule to recognize the illnesses and cure them.

Bicentennial Man

However, the most popular topic is the creation of machines equal to humans under any point of view: In this movie a physician reproduce skin.

We are fascinated and continuing writhing at the same time by the possibility to simulate our mind and its processes such as sensitivity to moods, feelings, temperaments, sensitivity to wildlife and animals, humor, spiritual consciousness and imagination.

Bicentennial Man

Comunque, la fantasia più ricorrente è la creazione di macchine uguali all'uomo sotto ogni punto di vista. In questo film un fisico riproduce perfino la pelle utilizzando nane particelle. E noi siamo, allo stesso tempo, affascinati e impauriti dalla possibilità di ricreare la mente umana e tutti i suoi processi, quali sensibilità agli stati d'animo, i sentimenti, i temperamenti, sensibilità alla fauna selvatica e gli animali, l'umorismo, la coscienza spirituale e l'immaginazione.

Crysis

Crysis è una sequela di video giochi ambientati nel 2021 quando la terra è soggetta ad un' invasione di alieni. I difensori della terra sono soldati armati di equipaggiamento nanotecnologico che dà loro più agilità, più forza e più efficienza. Qual è il loro segreto? La nano armatura è costruita con molecole formate da atomi di CryFibril, in altre parole grafene, che

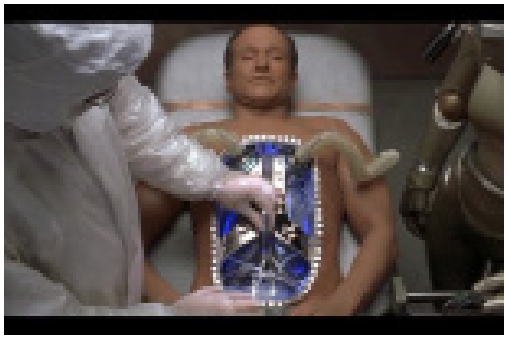


Fig. 7 Bicentennial Man

rendono la Nanosuit più leggera, più forte e più efficiente.

Eva

Portate al limite la vostra fantasia. Chiedetevi "E' possibile riprodurre davanti ai nostri occhi la psicologia della mente umana e i suoi processi? E se potessi manipolare le sinapsi?" Alex riesce a farlo.

Egli è solo il protagonista del film Eva.

Come fa? Grazie ad un dispositivo tecnologico simile a un proiettore cinematografico, lui crea la mappatura della mente artificiale nel vuoto: essa gli permette di trasferire le sinapsi, in altre parole le nane particelle, da un punto all'altro della mappa così da modificarne le caratteristiche. Ora immaginate un apparecchio identico nella realtà: i medici

Crysis

Crysis is a videogames series that takes place in 2021 on Earth when a lot of aliens invade the planet: the main characters are Nomad, Psycho and Alcatraz. They belong in an army that uses a nanotechnology equipment. Some soldiers defend their body and fight wearing the Nanosuit in three combat modes: armor, power, and stealth. This is build with the CryFibril molecules formed by graphene atoms, that make the Nanosuit lighter, stronger and efficient.

Eva

Alex is a cybernetic engineer who wants to reproduce human psychology and its processes. He can do it thanks to a projector-like device, which makes the brain mapping in the empty place: it permits to transfer nanoparticles that are artificial synapses so as to modify the artificial mind. Now, we can imagine a similar device, thanks to it we could cure also brain illnesses.

Fiction in nano science

Introduction

Imagine a human being who has amazing abilities and has the power to receive in a direct way the radio waves, he can adjust his eye and his sight and can also see through the deepest darkness like Riddick. The thickness of the walls will not be a problem for our character because he can see through the walls and beyond, he can travel and visit the outer space anytime he wants with the „space elevator" wearing intelligent clothes which clean themselves or do not get dirty at all. Even if these things seem to be more or less impossible and learned from SCI-FI movies, they actually exist and are at an early stage, with baby-steps touching their goals, all of this by means of NANOTECHNOLOGY.

Evolving The Nanotechnology From Art To Science

When it comes to nanotech, we have

Fig. 9- Alex modifies the robot's brain map thanks to his device

scienziati potrebbero curare malattie e disordini mentali.

Fiction in nano science

Introduzione

Immaginatevi un uomo qualunque, con capacità sorprendenti, ha il potere di ricevere le onde radio in modo diretto, di aggiustarsi la vista e di vedere anche tra la nebbia più densa come Riddick. Inoltre, può penetrarvi muri più spessi con lo sguardo, avere la possibilità di visitare il cosmo ogni volta con l'aiuto dell'"ascensore spaziale" e di vestirsi con vestiti intelligenti, che si puliscono da soli o non si sporcano mai. Anche se queste cose appaiono circa impossibili o presenti solo nelle SF, di fatto, esistono già e sono in uno stato primordiale. Tutto ciò è possibile grazie alla NANOTECNOLOGIA.

La Transformazione Della Nanotecnologia Dall'Arte In Scienza

Quando si tratta di nanotecnologia, abbi-

Fig. 1- Robocop soldier

the feeling we are in Star Trek movie but, suprisingly, there have been hundreds of products based on nanotechnology on the market for quite a while.

Robocop

A well-known character and concept is the equalizer-warrior Robocop, who has been talked up by SCI-FI movies. But the American army has proposed to itself to carry into effect this idea and probably within 2020, all soldiers will wear nanometrical armors which will be obtained from materials that contain nanotube-fibers and can protect soldiers from any bullet, from the rogue effects of explosions, with a colossal total toughness, being as adaptive as a flax at the same time, answering verbal commands and allowing the soldier to become invisible.

Nanotubes Clothes

Clothes which you can spray directly on your body. Sounds odd: Let me get dressed. Where did I put my blue blouse spray?". It surely seems impossible, just like the other inventions, but these kinds of clothes are more

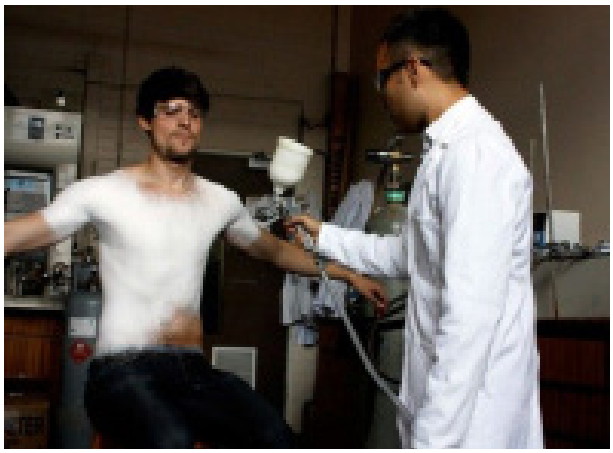


Fig. 2 The inventor of the spraying clothes testing a T-shirt on a volunteer.

hygienic and the biggest advantage is that you don't have to clean the up at all and they can develop your creativity in creating new clothes' models. The only problem is that they will be a bit expensive for quite a while and the estimated cost is $10.000.

This product it's called Fabrican and it was created by Manuel Torres, a Spanish designer who has dedicated 10 years of his life to get this invention to perfection. The

Fig. 3 The result of a sprayed T-shirt

amo la sensazione che ci troviamo in Star Trek, ma sorprendentemente sono presenti sul mercato da qualche tempo centinaia di prodotti basati sulla nanotecnologia.

Robocop

Un personaggio conosciuto è il guerriero della giustizia Robocop, il quale è stato reso famoso dai film del campo delle SF. Tuttavia l'esercito americano si è proposto da qualche tempo di mettere in pratica il progetto e, probabilmente nel 2020, tutti i soldati vestiranno "armature nanometriche", realizzate con materiali che contengono fibre di nano tubi che li difenderanno da ogni proiettile e dagli effetti distruttivi degli esplosivi, avendo una durezza colossale ma essendo flessibile come una tela, rispondendo ai comandi verbali di chi indossa l'armatura e permettendogli di essere invisibile.

Vestiti realizzati con nanotubi

Vestiti che puoi indossare polverizzandoli

Fig. 4 A sample of an invisible cloak

Fig. 5 A pattern of the nano contact lenses

clothes that you obtain by spraying them on the human body fit anyone and they dry instantly after skin contact. „Safety comes first!", so at every application it is more than necessary to wear goggles to avoid eye contact with the substance. The invention lies on a variety of soft goods like protective patches, padding, cleaning articles and interior decoration.

Invisible Clothes

In Scotland, a fabric has been created which seems to be able to play with the light beams and also with your mind. Thus and so, the person who wears the material becomes relatively invisible, as it happens with Harry Potter's famous „cloak of invisibility". The fabric is called Metaflex and it was created by Saint Andrew's University researchers in Scotland. The material makes the light take a bend, instead of reflecting it, hereby everything that lies behind the material disappears. It looks like magic, however the basis of this invention, which appears relatively simple, is a comprehensive study of physics.

Nano Contact Lenses

Sight is an essential sense for humans, which is why Washington's University researchers are trying to improve it through a

Fig. 7 A model of the flexible Nokia Morph

direttamente sul corpo. Suona strano: "Aspetta che mi vesto. Dove ho messo lo spray per la maglia azzurra?". Certamente, sembra impossibile, come le altre invenzioni, ma sono più igienici e il più grande vantaggio è che non devi lavarli e lasciano spazio all'immaginazione per la creazione di nuovi modelli di vestiti. L'unico problema è che per un periodo costeranno molto, la somma stimata si aggira sui 10.000 $.

Il prodotto si chiama Fabrican ed è stato inventato dal progettista spagnolo, Manel Torres, che ha dedicato dieci anni della sua vita allo sviluppo e perfezionamento di questa invenzione. I vestiti che si ottengono tramite la polverizzazione si adattano a chiunque e si asciugano all'instante dopo il contatto con la pelle. "La sicurezza viene al primo posto!", ecco perché ogni volta che si applica questo tessuto liquido, è necessario portare un paio di occhiali di protezione per evitare il contatto con gli occhi. L'invenzione si può estendere su una vasta gamma di tessuti come cerotti protettori, imbottiture, prodotti per la pulizia o decorazioni interne.

I Vestiti Invisibili

In Scozia è stato creato un materiale che pare giochi con i fasci di luce e con la tua mente, pertanto, la persona che lo veste diventa relativamente invisibile, come succede con il famoso mantello dell'invisibilità di Harry Potter. Il materiale si chiama Metaflex ed è stato creato dai ricercatori dell'Università di Saint Andrews, in Scozia. Il materiale curva la luce, invece di rifletterla, quindi, tutto quel che si trova dietro al materiale, scompare. Sembra magia, ma alla base di questa invenzione,

Fig. 6- A model of the future space elevator on a future terraformed Mars.

che pare relativamente semplice, si trova uno studio complesso di fisica.

Le Nanolenti A Contatto

La vista è un senso essenziale per l'uomo, per questo i ricercatori dell'Università di Washington cercano un modo per migliorarla con l'aiuto di una lente a contatto con un display. Può aiutare una persona ad arrivare alla

Fig. 8 All the ways that the device changes

contact lens with display.

For instance, the contact lenses can help a person to reach a desired destination from an unknown city. Hereby, the contact lens activates and shows clues and signs which the person can use to reach his/her destination. On this lens are placed electrical connections and an array of LEDs.

Space Elevator

Have you ever tried to imagine how we both heard Neil Armstrong observing the Earth from the Moon? In not more than fifteen years you will no longer need to be an astronaut to go to space, because nanotechnology may make it possible for any of us. The project is in an initial state in an institution which belongs to NASA, and envisages the construction of a space elevator. The latter will be very durable and built from a combination of carbon, discovered by a Japanese, in 1881, and renamed nano tube.

It will be very durable, built from a carbon based material, discovered by a Japanese in 1881 which he called „nano tube".

Nokia Morph

Nokia has managed to merge a series of technologies into a single device which, again, seems magical. This fascinating device can change its form from bracelet to a common cellphone or a pedestal

desk. It is transparent, its surface can clean itself and can be charged from any power source it detects by itself. The device

destinazione voluta in una città sconosciuta, per esempio. In questo modo, la lente si attiva e mostra più indizi e indicatori che la persona messa in causa, possono utilizzare per raggiungere la destinazione gradita. Su questa lente sono montate connessioni elettriche e una matrice di led.

L'ascensore Spaziale

Avete mai provato ad immaginare come si sia sentito Neil Armstrong osservando la Terra dalla Luna? In non più di quindici anni non sarà più necessario essere un astronauta per visitare lo spazio, poiché la nanotecnologia può renderlo possibile a chiunque di noi. Il progetto si trova in uno stato iniziale in un istituto che appartiene alla NASA, e prevede la costruzione di un ascensore spaziale. Quest'ultimo sarà molto resistente e costruito da una combinazione di carbonio, scoperta da un giapponese, nel 1881, e ribattezzata nano tubo.

Nokia Morph: Materiali Che Si Trasformano

La Nokia è riuscita a compattare diverse tecnologie in un solo dispositivo che, di nuovo, pare un oggetto magico. Quest'apparecchio affascinante può cambiare la forma da un bracciale a un telefono comune o piedistallo per la scrivania.

È trasparente, la superficie si può pulire da sola e riesce a caricarsi con qualunque risorsa di energia che rivela. L'apparecchio è esposto al Museo di Arte Moderna a New York, dove dimostra la flessibilità di cui è capace offrendo ispirazione e visione per nuove scoperte nel futuro.

Conclusione

Dalla sua apparizione sul pianeta, l'uomo ha dimostrato che la sua capacità creativa è illimitata. Tutto ciò che l'uomo immagina, la mente crea. Le invenzioni basate sulla nanotecnologia sono promettenti e conducono non solo alla miglioramento della vita, ma anche alla rimozione della routine, lasciando il posto all'immaginazione e all'inventiva dell'uomo. Verrà il momento in cui la maniglia dell'ombrello si scalderà a contatto con la nostra mano grazie a dei nano sensori termici; o quando ci cureremo grazie all'aiuto dei nanofarmaci che sostituiranno medici ed ospedali.

is exhibited at the Modern Art Museum in New York and aims to demonstrate the flexibility of which it is capable, providing inspiration and vision for the amazing discoveries in the future.

Conclusion

From his appearance on the planet, man has demonstrated that his creative ability is unlimited. Whatever man imagines, the mind creates. Nanotechnology-based inventions are promising and lead not only to the improvement of life, but also to the removal of the routine, giving way to the imagination and ingenuity of man. There will come a time when the handle of the umbrella you will warm to touch with our hands thanks to nano thermal sensors; or when we with the help of nanofarmaci to replace doctors and hospitals. Likewise, schools will be able to identify the needs of any child with the help of nanopsicologi and, after identifying the profile of each child through a psychological diagnosis, can learn about their natural inclinations and improve them.

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Ugualmente, le scuole potranno identificare i bisogni di qualunque bambino con l'aiuto di nanopsicologi e, dopo aver identificato il profilo di ogni bambino tramite una diagnosi psicologica, potranno conoscere le loro inclinazioni naturali e migliorarle.

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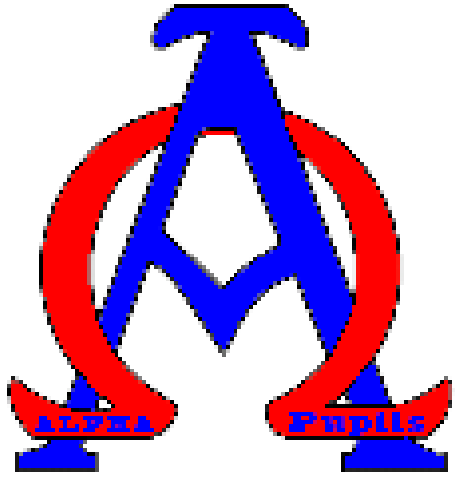

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Nanoprocessors in computers

Nanoprocesoare în computere

Velniciuc Adi

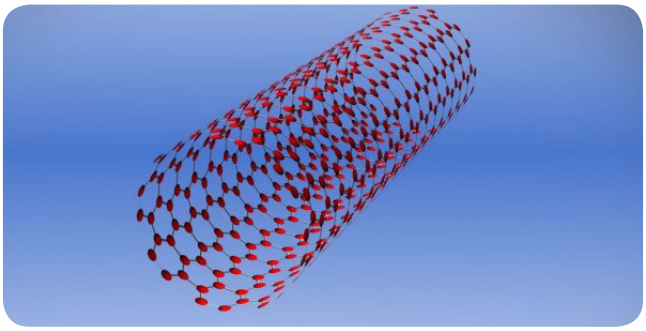

Fig.1. Carbon nanotube

Introduction

Significant changes have been made in recent years in the computer industry and the entire IT world. Many of these changes are based on three factors: the growing interest both in the business field and the efficient power consumption, the growth in mobile computing and the growth of performance necessary to computers' devices in a rapid expansion of the multimedia environment.

In 1965 Gordon Moore, co-founder of Intel, predicted that the number of transistors in a dense integrated circuit, embedded in the chip of a microprocessor, would double approximately every 18 months.

Nanotechnology has contributed not only to respect Moore's prediction, but it has also enriched the context in which that prediction could be outperformed.

This article aims at pointing out the important achievements of nanotechnology in the area of processors for computers.

The nano-manufacturing of processors

The electronic components successfully obtained in the form of carbon nanotubes include: transistors, diodes, relays, etc.

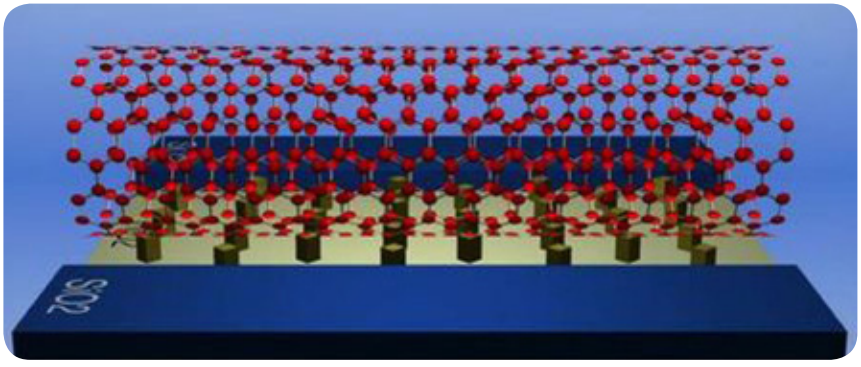

Fig.2. Carbon nanotube with modified underlayer

Introducere

Ultimii ani au cunoscut schimbări importante în industria procesoarelor, şi în întregul peisaj al tehnologiei informaţiei (IT). Multe dintre aceste schimbări au la bază 3 factori: creşterea interesului atât în domeniul afacerilor cât şi al consumului eficient de energie, creşterea computerizării mobile şi creşterea performanţelor necesare dispozitivelor calculatorului într-o expansiune rapidă a mediului multimedia.

Încă din anul 1965, Gordon Moore, cofondatorul Intel, a prezis că numărul tranzistorilor conţinuţi de cipul unui microprocesor va fi dublat aproximativ la fiecare 18 luni.

Nanotehnologia nu numai că a contribuit la respectarea predicţiei lui Moore, dar a îmbogăţit contextul în care această previziune să poată fi surclasată.

Acest articol îşi propune să evidenţieze realizări importante ale nanotehnologiei în domeniul procesoarelor pentru computere.

Nanofabricarea procesoarelor

Componentele electronice obţinute cu succes sub forma nanotuburilor de carbon au inclus: tranzistori, diode, relee, etc.

Istoria acestora începe de la primele realizări în domeniul cercetării nanocomputerelor şi anume obţinerea de tranzistori "single-electron tunnelling" de către Avenin şi Likharev, în 1985.

Conexiunea intre componentele

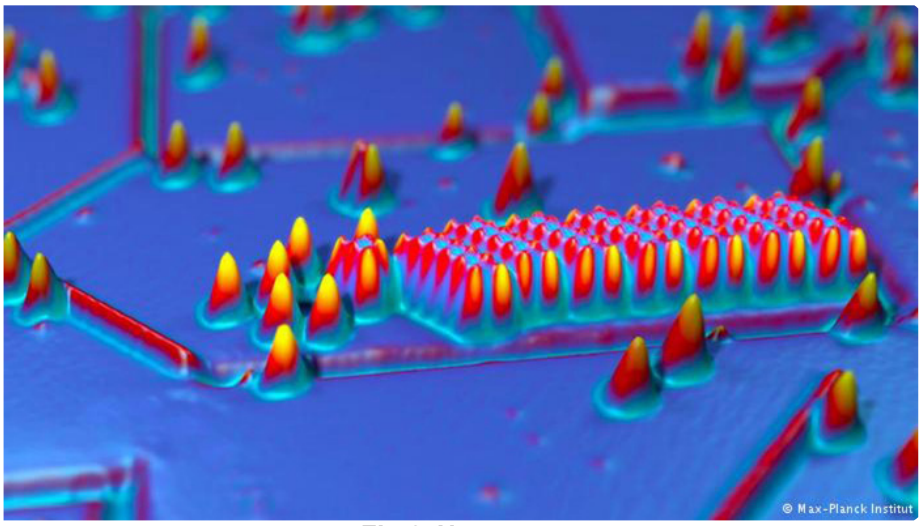

Fig.3. Nanoprocessors

Their history began with the first achievements in nanocomputers research, namely the production of single-electron tunneling transistors by Avenin and Likharev in 1985. The connection between the electronic components of a computer was done through integrated semiconductor nanofibers.

The chemical composition, the architecture and the design of the integrated circuits represented researchers' subsequent concerns. Thus, the first advanced millimeter-scale microprocessors were those made of silicon.

Proving their supremacy in the electronic industry, silicon microprocessors became smaller and smaller, being essential elements of portable PCs. However, the smaller and smaller size affected silicon microprocessors reliability. That is why researchers looked for another material to remove such disadvantages as overheating, energy waste, and the sometimes faulty functioning.

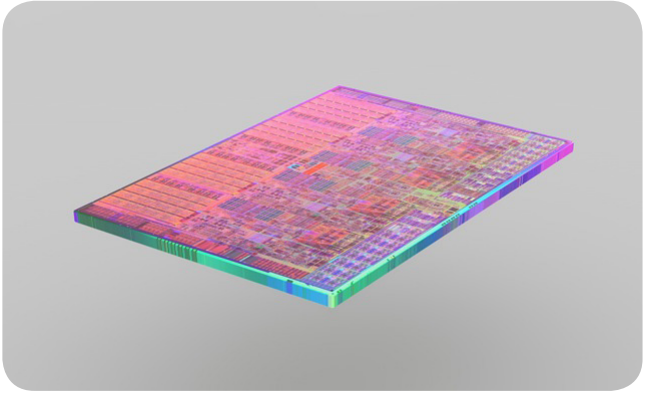

Fig.4. The die of silicon

A new material, carbon in the form of nanotube, became the center of scientists' study in the electronic industry since early 1991, when it was synthesized by S. Iijima from NEC.

In this way, carbon nanotubes drew the attention of a team of researchers from San Diego, University in California. They developed a transistor made of only three carbon nanotubes in the form of Y junction. The technical brilliance resides in the fact that the metal

electronice ale unui computer s-a realizat prin intermediul nanofirelor semiconductoare integrate. Compoziţia chimică, arhitectura şi design-ul circuitelor integrate au constituit preocupări ulterioare ale cercetătorilor.

Astfel, primele microprocesoare performante la scară de câţiva milimetri au fost cele de siliciu. Dovedindu-şi supremaţia în industria electronică, microprocesoarele de siliciu au devenit din ce în ce mai mici, fiind elemente vitale ale computerelor personale portabile. Totuşi, dimensiunea din ce în ce mai mică a afectat fiabilitatea micropocesoarelor de siliciu, de aceea cercetătorii au căutat un alt material care să elimine dezavantaje cum ar fi supraîncălzirea, risipă de energie şi funcţionarea uneori defectuoasă.

Un nou material, şi anume carbonul sub formă de nanotub, a devenit centrul studiului cercetătorilor din domeniul industriei electronice încă din 1991, când a fost sintetizat de S. Iijima de la NEC.

Astfel, nanotuburile de carbon au atras atenţia unei echipe de cercetători de la Universitatea din San Diego, California. Aceştia au realizat un tranzistor alcătuit doar din trei nanotuburi de carbon în formă de Y. Ingenios este faptul că porţile metalice care controlează fluxul de electroni au fost constituite din straturi de fier-titan depuse pe nanotuburi în timpul sintezei acestora.

O altă echipă de cercetători care pledează cu argumente teoretice solide noua tehnolo-

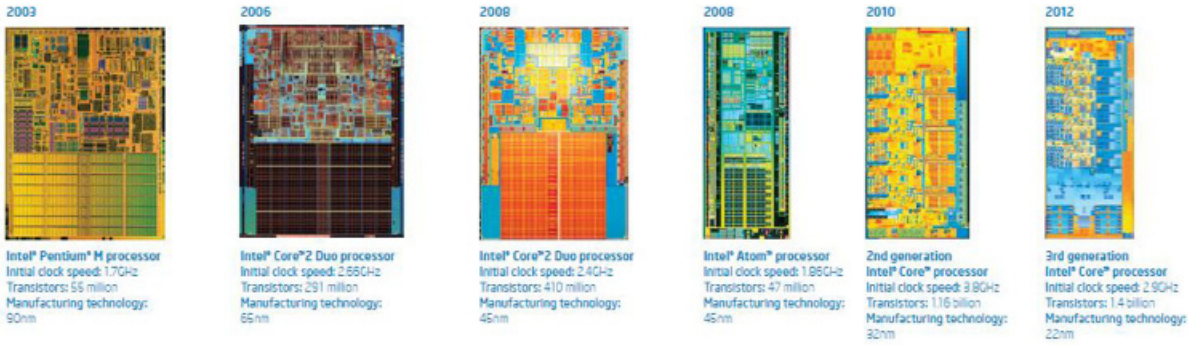

Fig.5. Evolution of Intel processors

gates which control the flow of electrons were made of iron-titan layers deposited on nanotubes during their synthesis.

Another team of researchers, who argue with solid arguments for the new technology of the transistors and nanoscale connectors based on carbon nanotubes, is that from the University of British Columbia in Vancouver. According to a recently published article, carbon nanotubes feature a strong chemical, thermal and mechanical stability, being a good semiconductor in the presence of palladium ends meant to control electronic transi-

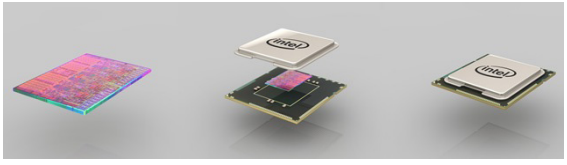

Fig.6. A finished microprocessor

tion, which recommends these new materials for the implementation of integrated circuits on the nanometer scale.

IBM researchers are also optimistic about carbon nanotubes which will soon replace silicon in order to successfully minimize transistors. IBM state that they have succeeded in positioning carbon transistors, creating a model circuit on a mixed underlayer of hafnium oxide and silicon oxide.

Stanford University researchers led by professors Subhasish Mitra and H.-S. Philip Wong are convinced that carbon nanotubes represent the promissing succesors of silicon semiconductor materials in order to overpass the heat waste phenomenon from thin circuits.

Actually, in 2012, Intel manufactured the

gie a tranzistorilor şi punţilor de legătura la scara nano, având la baza nanotuburile de carbon, este cea de la Universitatea British Columbia din Vancouver. Potrivit unui articol publicat recent, nanotuburile de carbon prezintă o puternică stabilitate chimică, termică şi mecanică, fiind un bun semiconductor, în prezenţa unor capete de paladiu care să controleze tranziţia electronilor, ceea ce recomandă aceste noi materiale pentru implementarea de circuite integrate la scară nano.

Cercetătorii de la IBM sunt şi ei optimişti în legătură cu nanotuburile de carbon care va înlocui curând siliciul pentru miniaturizarea cu succes a tranzistorilor. IBM declară că ar fi reuşit să poziţioneze tranzistorii de carbon creând un circuit model pe un substrat mixt de oxid de hafniu şi oxid de siliciu. (Fig.1, Fig.2)

Cercetătorii de la Universitatea Stanford, conduşi de profesorii Subhasish Mitra şi H.-S. Philip Wong sunt convinşi că nanotuburile de carbon reprezintă succesori de valoare ai semiconductorilor pe bază de siliciu, noile materiale vor depăşi fenomenul de supraîncălzire ce are loc în circuitele de grosime nano actuale.(Fig.3, Fig.4).

Totuşi, în anul 2012, Intel a fabricat cea de-a treia generaţie de procesoare folosind nanotehnologie pe bază de siliciu, ceea ce dovedeşte că limitele acestui material nu au fost încă atinse.(Fig.5, Fig.6)

third generation of processors using silicon-based nanotechnology which proves that the limits of this material haven't been reached yet.

Conclusions

Researchers' imagination, inspiration and vision are basic elements which will support the subsequent evolution of integrated processors in a clean and safe environment for people, as Intel already sustains. Nanotechnology will bring nanocarbon computers in our hands soon, when a new era of semiconductors will be started.

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Concluzii

Imaginaţia, inspiraţia şi viziunea cercetătorilor sunt elemente de bază ce vor susţine evoluţiile ulterioare ale procesoarelor integrate într-un mediu curat şi sigur pentru umanitate, aşa cum promovează deja firma Intel.Nanotehnologia va aduce curând în mâinile noastre computerele confecţionate din nanotuburi de carbon, dovedind o nouă revoluţie în domeniul semiconductorilor.

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