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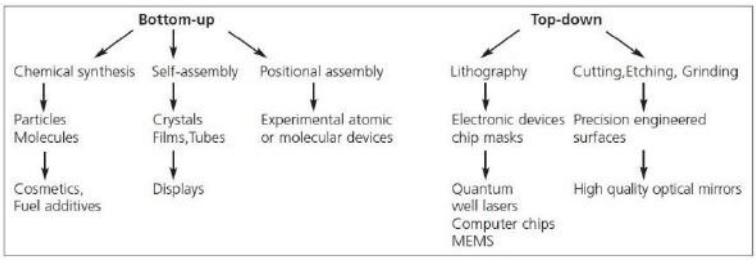
COLLEGE OF ENGINEERING& TECHNOLOGY
AKOLA

Technical Newsletter

NANO MANUFACTURING

Contents

The prefix 'nano' is derived from the Greek word for dwarf. One nanometer (nm) is equal to one-billionthof a meter, 10–9m. A human hair is approximately 80,000nm wide, and a red blood cell approximately7000nm wide. The conceptual underpinnings of nanotechnologies were first laid out in 1959 by the physicist Richard Feynman, in his lecture 'There's plenty of room at the bottom' (Feynman 1959). Feynman explored the possibility of manipulating material at the scale of individual atoms and molecules, imagining the whole of the Encyclopedia Britannica written on the head of a pin and foreseeing the increasing ability to examine and control matter at the nano scale. There are a wide variety of techniques that are capable of creating nanostructures with various degrees of quality, speed and cost. These manufacturing approaches fall under two categories 'bottom-up', and 'top-down'. In recent years the limits of each approach, in terms of feature size and quality that can be achieved, have started to converge. A diagram illustrating some of the types of materials and products that these two approaches are used for is shown below in Figure 1



Bottom-up manufacturing involves the building of structures, atom-by-atom or molecule-by-molecule. The wide variety of approaches towards achieving this goal can be split into three categories: chemical synthesis, self-assembly, and positional assembly. Chemical Synthesis is a method of producing raw materials, such as molecules or particles, which can then be used either directly in products in their bulk disordered form, or as the building blocks of more advanced ordered materials. Self Assembly is a bottom-up production technique in which atoms or molecules arrange themselves into ordered nano scale structures by physical or chemical interactions between the units. The formation of salt crystals and snowflakes, with their intricate structure, are examples of self-assembly processes. Although self-assembly has occurred in nature for thousands of years, the use of self-assembly in industry is relatively new. The final bottom-up technique is Positional Assembly, whereby atoms, molecules or clusters are deliberately manipulated and positioned one-by-one.

Positional assembly is extremely laborious and is currently not suitable as an atomic-scale industrial process.

Top-down- Manufacturing involves starting with a larger piece of material and etching, milling or machining a nanostructure from it by removing material (as, for example, in circuits on microchips). This can be done by using techniques such as precision engineering and lithography, and has been developed and refined by the semiconductor industry over the past 40 years. Top-down methods offer reliability and device complexity, although they are generally higher in energy usage, and produce more waste than bottom-up methods. The production of computer chips, for example, is not yet possible through bottom-up methods; however, techniques using bottom-up (or hybrid top-down/bottom-up) methods are under exploration.

Precision Engineering: In general, ultra-precision engineering and manufacture underpin much of the micro-electronics industry in everything from the production of the flat low-damage semiconductor wafers used as substrates for computer chips, to the mechanical stages used to position the wafers, to the manufacture of the precision optics used to print the patterns on the wafers. In addition, the techniques of ultra-precision engineering are used in a variety of consumer products such as computer hard disks, CD and DVD players.

Lithography: It involves the patterning of a surface through exposure to light, ions or electrons, and then subsequent etching and/or deposition of material on to that surface to produce the desired device. The ability to pattern features in the nanometer range is fundamental to the success of the IT industry. The main lithographic tools can be conveniently separated into methods that use a focused beam of electrons or ions to write patterns, and those that rely on the projection of light through a mask to define a pattern over a complete semiconductor wafer. Electron- and ion-based methods are both capable of making sub-10nm structures (with electron beam lithography having the greatest routine resolution), but they are too slow to be used directly in production. Optical lithography is used for production of semiconductor devices. Although it does not have the resolution of the beam-based techniques, it provides rapid throughput and cost-effective manufacture. Electron beam lithography is primarily used to fabricate the masks used for optical lithography, and ion beam techniques are mostly used to repair masks and for specialist device applications. The potential benefits of nanotechnologies should be assessed in terms of life cycle assessment (LCA)(sometimes referred to as 'cradle-to-grave' analysis). LCA is the systematic analysis of the resource usages (for example, energy, water, and raw materials) and emissions over the complete supply chain from the 'cradle' of primary resources to the 'grave' of recycling or disposal. For example, one of the areas of application foreseen for nanomaterials is in photovoltaic (PV) energy converters in order to increase efficiency. An LCA would investigate the extent to which the additional energy yield over the service life of a PV device would be offset by any additional energy used in manufacturing the device and in recovering or disposing of its material content at the end of its life. It is hoped that the idea of nanomanufacturing will encompass genuine 'green' concepts of zero waste and little or no solvent use incorporating life cycle.

Prof. S. C. Makwana
H. O. D
Mechanical Engineering

Departmental Activities

Computer Science & Engineering

Hon. Dr. Panjabrao Deshmukh Jayanti Samaroh

During Hon. Dr. Panjabrao Deshmukh Jayanti Samaroh (24th Dec to 27th Dec'15), students of Computer science & engineering took part in various activities like Rangoli Competition, Essay competition etc. Response to the activity was overwhelming. Miss Mohini Wadatkar and Diksha Asanmol received first prize in Rangoli competition.

Technothlon' 2016

In a yearly mega technical event i.e. Technothlon'16, students of all department took part in various activities like Paper presentation, Blind racing, Googler, Lan gaming etc. on 11th Feb'16. CSE department organized the event. Many students within college and students from outside technical institutions participated in various events. This event turned out to be a grand success.

Technothlon'16 is followed by annual social gathering in which various cultural events like Dance, Drama, Fashion Show, Orchestra were arranged to showcase other curricular activities of the students. Students celebrated the "Traditional Day" by demonstrating traditional costumes used in various parts of India. After this activity, Anand Mela was arranged in which many students took active interest.

Training and Placement:

- 23 students were placed in CMS Technologies, Mumbai.
- 9 students were placed in Balarkha Technologies, Gudgaon, in the campus drive held in COET, Akola.

Departmental Activities

Textile Engineering

- Prof. S. K. Agrawal and Mr. Kunal Thakur, a final year student, published a paper titled, **"To study the mechanical behavior of composites based on re-reeling mulberry silk waste with unsaturated polyester resin"**, in the international journal on Textile Engineering and Processes. [ISSN no. 2395-3578, Vol. 2, Issue 1, Jan 2016]
- Six students are selected in the campus interview in a reputed textile unit Sapna Mats, Aurangabad.

DEPARTMENT OF ARCHITECTURE

- On 16 January 2016, the Head of Architecture Department of N.I.T., Raipur, Prof. Abir Bandhopadhyay was invited for guest lecture on the topic of "Indian Temple Architecture". The lecture was arranged in Room No. 102, in which large number of students from Architecture and Civil Engineering Department were present along with departmental staff.
- In the "Students Activity Forum" of architecture department which usually takes place on alternate Saturdays, three activities were arranged. In first activity a workshop on "Clay Modeling" was arranged on 16 Feb. 2016 in which a famous Sculpturist Mr. Ravi Krishnan guided the students. In second activity, on 30th Jan. 2016, an interesting lecture was given on "Bird Watching" by Ornithologist Mr. Deepak Joshi.

Bird Waching programme was arranged on 31 Jan. 2016 wherein students from all classes were taken to the Kapashi Talav, a natural water body famous for migrated birds in the winter. Ornithologist Mr. Dipak Joshi & Prof. Dilip Jade, Prof. Malini Nathe along with students of architecture took active part in the activity.

Highlights

SOLAR CHARGING STATIONS – A NEED OF AN HOUR IJPRET, 2016; Volume 4 (8): 515-529 ISSN: 2319-507X INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

Dr. Prof. SANJAY N. NAIKWAD
Department of Electrical Engineering, College of Engineering & Technology, Akola
Prof. JYOTI P. DHUMALE
Department of Chemistry, College of Engineering & Technology, Akola

Abstract : With ever increasing demand of energy, fast depletion of conventional energy sources and considering associated environmental problems, scientists are looking forward to tap solar energy as an alternative. On this ground, electric vehicles also gaining momentum. Automotive batteries and other storage batteries require charging in safe and cost effective manner. Role of charging station in this context is very important. This paper highlighted various issues related to charging stations and their performance and also discusses the need of solar charging stations in current changing scenario.

Keywords: Charging Stations, Electrical Vehicle (EV).

Upcoming Event

- **National conference on Renewable energy technologies and its application on 2nd April**

QUOTE FOR LIVING

Everyone wants happiness, no one wants' pain, but you can't make a rainbow with a little Rain

- Jack C. Ray

✓ HEALTH CORNER

Stress Management

Learn to see challenges as opportunities and stress as only temporary problem, not a disaster. Practice solving problems and ask others for help and guidance. Create small goals, make time to relax, be optimistic, believe in yourself, and deep breathe.

This E- Newsletter published by R & D Cell on behalf of College of Engineering & Technology, Babulgaon, Akola.