Science Tech Entrepreneur
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Techno-watch

Windmill to the rescue

The first phase of the Golden Park housing project in Kalyan in Thane district ended about two years ago. By then the builder was fed up with the irregular power supply that had escalated the cost and delayed the project. Now, it is the residents who face the ordeal of seven to eight hours of erratic power cuts daily.

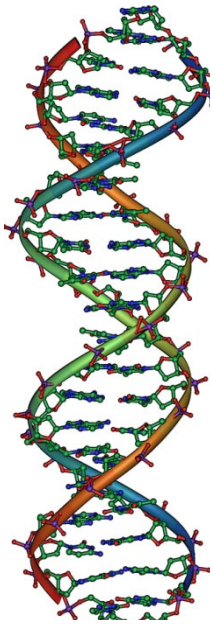
The Maharashtra state electricity distribution company is of little help. The second phase of the project-eight 13-storey buildings on about 14,000 sq m-faces no such problems; the builder expects to finish it by the end of this year. He is no longer at the mercy of the state electricity distribution company. The windmill is up and running since 1st April 2009. With the installation of windmill the construction is going in full swing. It generates 15kW of power every. The windmill can generate enough power to run machinery and two elevators of a 12-storey building and 55 tube lights every day. Deepak Dedhia who builds skyscrapers in Mumbai and suburbs saves over Rs 20,000 per month on electricity.

The decision made, Dehdia and his younger brother spoke to several Chinese companies but none of them accepted the proposal to erect a windmill. Finally, a company dealing in power conditioning systems in Pune agreed.

No special permission was required because the windmill weighs less than 500 kg. Datagurd, the Pune Company installed the windmill and Lumen Industries in Kalyan provided the charger in which the electricity generated is stored and utilized during power cuts. The windmill is installed on top of a water tank on a 13-storey building. It comprises a turbine, three blades that are three metres long each and a six-metre-long pole. A battery is attached to the wind turbine. After the second phase is over, the windmill would be handed over to the housing society. The residents would use the free power and maintain the windmill. Maintenance is not expensive or cumbersome. The battery, which costs about Rs 4 lakh, needs to be changed every seven to eight years. The installing of the windmill cost Dedhia Rs 10 lakh. Wind turbines don't need to be manually switched on and off. In case of a storm, there is no need to worry as the charger automatically switches off the windmill. **Source:** Down To Earth, July 09

DNA nanomachine can predict pH of live cells

Yamuna Krishnan and her colleague, Souvik Mody at the National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bangalore have designed a nanomachine by joining DNA (Deoxyribonucleic acid) pieces.



Yamuna explained the device as composed of three short DNA strands. When there are protons in the medium and it is acidic, there is a shape change in the DNA strands. This shape is lost when there are no protons. It is like a pair of ice tongs, which has two confirmations, an open state and a closed state. The whole structure is only about 7 nanometres.

Fluorescent tags: The DNA has fluorescent tags attached to it, which glow green in the open state and the pH (pH is a measure of the acidity or basicity of a solution. It is defined as minus the decimal logarithm of the hydrogen ion activity in an aqueous solution) is neutral. In the closed state, say when pH is about 4, the shape is a closed state and the fluorescence is red. The pH is low when there are more protons.

The DNA will be in different states of being open and closed depending upon the concentration of protons. It will glow green in the absence of protons and red when there are many protons. The colour changes accordingly — green to lime green … dark orange to red. These experiments were on fruit fly cell lines but they could be done in mammalian cells, too.

How many of these assemblies would therefore be typically required to read the pH of a group of cells? “More experiments will be needed to ascertain that,” says Dr. Krishnan. “The important aspect of this machine is that it gives specific information about a specific part of the cell.”

Nutrients and viruses reach the cell membrane and move into the cell using a process called as endocytosis. Here, the DNA is stuck on a protein called Transferrin, which gets into a cell through endocytosis. Transferrin is specific to a region of the cell and hence delivers the DNA to this region.

When any nutrient or a foreign object enters a cell, it moves through the cell with a characteristic rate of change of pH. At every step it has an associated pH and if the pH does not reach the level that it should, then it could lead to a different disease.

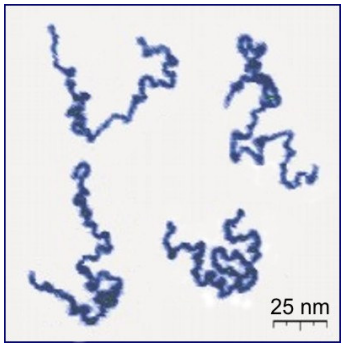
pH may not be the reason why something happens but it could be a good molecular correlate of biochemical events. We can actually see what the chemical changes in the cell can lead to. Similarly, cancer cells have varying pH and acidity. Dr. Krishnan also works on using DNA capsules for drug delivery. Apart from other applications, the DNA capsules could prevent dangerous drugs from leaking out until they reach their intended targets.

About the drug capsule, she says, “The DNA shell could also allow attachment to a protein that could ferry the drug-loaded capsule to a target cell. So, someone on chemotherapy need not swallow a lot of drugs, as patients have to, today. They have to suffer a lot of side effects because the medicine is directed to the good and bad cells.

Source: www.hindu.com. Jul 23, 2009

Polymer reduces radioactive waste

Indian scientists have developed a new polymer that reduces radioactive waste in nuclear reactors, making the decontamination process a less expensive one. Referred to as 'Cobalt Imprinted Polymer', the compound selects the radioactive cobalt ions in the nuclear coolants to dissolve and remove them without altering their properties.



"The polymer is imprinted with a memory for cobalt ions, source of radioactivity in most nuclear plant coolant channels. By doing this, the radioactive ions will be trapped in very small volume of this special polymer.

The compound has been synthesised in such a way that they have pre-designed "holes" to selectively recognise and trap cobaltions. Such pre-designed selectivity is the key aspect of such imprinted polymers, he said.

Conventionally, a solution of mild chemicals is used to remove the corrosion products i.e. metal oxides by circulating chemicals in the coolant circuits. The solution comprises both radioactive and non-radioactive ions, namely cobalt and iron respectively.

Source: www.hindu.com. Aug 13, 2009

New Microchip Technology Performs 1,000 Chemical Reactions At Once

Flasks, beakers and hot plates may soon be a thing of the past in chemistry labs. Instead of handling a few experiments on a bench top, scientists may simply pop a microchip into a computer and instantly run thousands of chemical reactions, with results — literally shrinking the lab down to the size of a thumbnail. Towards that end, UCLA researchers have developed technology to perform more than a thousand chemical reactions at once on a stamp-size, PC-controlled microchip, which could accelerate the identification of potential drug candidates for treating diseases like cancer.

A team of UCLA chemists, biologists and engineers collaborated on the technology, which is based on microfluidics — the utilization of miniaturized devices to automatically handle and channel tiny amounts of liquids and chemicals invisible to the eye. The chemical reactions were performed using in situ click chemistry, a technique often used to identify potential drug molecules that bind tightly to protein enzymes to either activate or inhibit an effect in a cell, and was analyzed using mass spectrometry. While traditionally only a few chemical reactions could be produced on a chip, the research team pioneered a way to instigate multiple reactions, thus offering a new method to quickly screen which drug molecules may work most effectively with a targeted protein enzyme. In this study, scientists produced a chip capable of conducting 1,024 reactions simultaneously, which, in a test system, ably identified potent inhibitors to the enzyme bovine carbonic anhydrase. A thousand cycles of complex processes, including controlled sampling and mixing of a library of reagents and sequential micro channel rinsing, all took place on the microchip device and were completed in just a few hours. At the moment, the UCLA team is restricted to analyzing the reaction results off-line, but in the future, they intend to automate this aspect of the work as well.

"The precious enzyme molecules required for a single in situ click reaction in a traditional lab now can be split into hundreds of duplicates for performing hundreds of reactions in parallel, thus revolutionizing the laboratory process, reducing reagent consumption and accelerating the process for identifying potential drug candidates," said study author Hsian-Rong Tseng, a researcher at UCLA's Crump Institute for Molecular Imaging.

Source: Chemical Weekly, September 1, 2009

Note: The author may have used various references in the preparation of this article. For further details please contact him/her.