Conserve™ The Energy

It's Tomorrow™

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Nanotechnology

Why ???

We the people on the earth are gifted with wonderful energy sources by the nature, which has made our routine much more smother & easier… However, this gift of the nature is ' limited '. What we have done is, with the growth of science & technology, we have started using it extremely, because of which the energy resources are going to finish in near future. Hence, let us take the pledge to conserve the energy - save the energy!!!

Tips of the Month

Article - 1 : Healing kidneys with nanotechnology

Each year, there are some 13.3 million new cases of acute kidney injury (AKI), a serious affliction. Formerly known as acute renal failure, the ailment produces a rapid buildup of nitrogenous wastes and decreases urine output, usually within hours or days of disease onset. Severe complications often ensue. AKI is responsible for 1.7 million deaths annually. Protecting healthy kidneys from harm and treating those already injured remains a significant challenge for modern medicine.

In new research appearing in the journal Nature Biomedical Engineering, Hao Yan and his colleagues at the University of Wisconsin-Madison and in China describe a new method for treating and preventing AKI. Their technique involves the use of tiny, self-assembling forms measuring just billionths of a meter in diameter.

The triangular, tubular and rectangular shapes are designed and built using a method known as DNA origami. Here, the base pairing properties of DNA's four nucleotides are used to engineer and fabricate DNA origami nanostructures (DONs), which self-assemble and preferentially accumulate in kidneys.

"The interdisciplinary collaboration between nanomedicine and the in-vivo imaging team led by professor Weibo Cai at the University of Wisconsin-Madison and the DNA nanotechnology team has led to a novel application -- applying DNA origami nanostructures to treat acute kidney injury," Yan says. "This represents a new horizon for DNA nanotechnology research."

Kidneys perform essential roles in body, removing waste and extra water from the blood to form urine. Urine then flows from the kidneys to the bladder through the ureters. Wastes in the blood are produced from the normal breakdown of active muscle and from foods, which the body requires for energy and self-repair.

The protective and therapeutic effects of the DONs described in the new study are due to the ability of the nanostructures to scavenge reactive oxygen species, thereby insulating vulnerable cells from damage due to oxidative stress. This effect was studied in human embryonic kidney cell lines as well as in living mice. The

*Image Source:
https://www.sciencedaily.com/releases/2018/11/181108142315.htm

accumulation of the nanostructures in both healthy and diseased kidneys provided an increased therapeutic effect compared with traditional AKI therapy.

*Source: https://www.sciencedaily.com/releases/2018/11/181108142315.htm

Article - 2 : Eco-friendly nanoparticles for artificial photosynthesis

Researchers at the University of Zurich have developed a nanoparticle type for novel use in artificial photosynthesis by adding zinc sulfide on the surface of indium-based quantum dots. These quantum dots produce clean hydrogen fuel from water and sunlight -- a sustainable source of energy. They introduce new eco-friendly and powerful materials to solar photo catalysis.

Quantum dots are true all-rounders. These material structures, which are only a few nanometers in size, display a similar behavior to that of molecules or atoms, and their form, size and number of electrons can be modulated systematically. This means that their electrical and optical characteristics can be customized for a number of target areas, such as new display technologies, biomedical applications as well as photovoltaic's and photo catalysis.

The three-nanometer particles consist of a core of indium phosphide with a very thin surrounding layer of zinc sulfide and sulfide ligands. "Compared to the quantum dots that contain cadmium, the new composites are not only environmentally friendly, but also highly efficient when it comes to producing hydrogen from light and water," explains Greta Patzke. Sulfide ligands on the quantum dot surface were found to facilitate the crucial steps involved in light-driven chemical reactions, namely the efficient separation of charge carriers and their rapid transfer to the nanoparticle surface.

The newly developed cadmium-free nanomaterials have the potential to serve as a more eco-friendly alternative for a

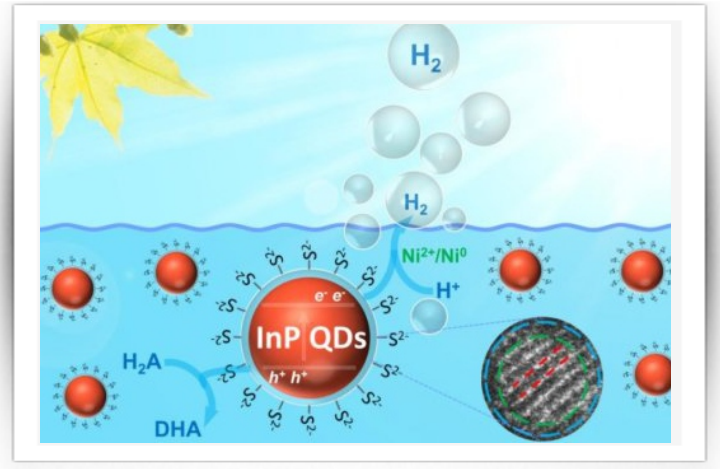

*Image Source:
https://www.sciencedaily.com/releases/2018/10/181001101929.htm

variety of commercial fields. "The water-soluble and biocompatible indium-based quantum dots can in the future also be tested in terms of biomass conversion to hydrogen. Or they could be developed into low-toxic biosensors or non-linear optical materials, for example."

*Source: https://www.sciencedaily.com/releases/2018/10/181001101929.htm

Article - 3 : Bionic mushrooms' fuse nanotech, bacteria and fungi

In their latest feat of engineering, researchers at Stevens Institute of Technology have taken an ordinary white button mushroom from a grocery store and made it bionic, supercharging it with 3D-printed clusters of cyano bacteria that generate electricity and swirls of graphene nanoribbons that can collect the current.

"In this case, our system -- this bionic mushroom -- produces electricity," said Manu Mannoor, an assistant professor of mechanical engineering at Stevens. "By integrating cyano bacteria that can produce electricity, with nanoscale materials capable of collecting the current, we were able to better access the unique properties of both, augment them, and create an entirely new functional bionic system."

Cyano bacteria's ability to produce electricity is well known in bioengineering circles. However, researchers have been limited in using these microbes in bioengineered systems because cyano bacteria do not survive long on artificial bio-compatible surfaces. Mannoor and Sudeep Joshi, a postdoctoral fellow in his lab, wondered if white button mushrooms, which naturally host a rich microbiota but not cyano bacteria specifically, could provide the right environment -- nutrients, moisture, pH and temperature -- for the cyano bacteria to produce electricity for a longer period.

Mannoor and Joshi showed that the cyano bacterial cells lasted several days longer when placed on the cap of a white button mushroom versus a silicone and dead mushroom as suitable controls. "The mushrooms essentially serve as a suitable environmental substrate with advanced functionality of nourishing the energy producing cyano bacteria," says Joshi.

Mannoor and Joshi used a robotic arm-based 3D printer to first print an "electronic ink" containing the graphene nanoribbons. This printed branched network serves as an electricity-collecting network atop the mushroom's cap by acting like a nano-probe -- to access bio-electrons generated inside the cyano bacterial cells.

Next, they printed “bio-ink” containing cyano bacteria onto the mushroom's cap in a spiral pattern intersecting with the electronic ink at multiple contact points. At these locations, electrons could transfer through the outer membranes of the cyano bacteria to the

*Image Source:
https://www.sciencedaily.com/releases/2018/11/181107082454.htm

conductive network of graphene nanoribbons. Shining a light on the mushrooms activated cyano bacterial photosynthesis, generating a photocurrent.

*Source:
https://www.sciencedaily.com/releases/2018/11/181107082454.htm

Article - 4 : Moths and magnets could save lives

A new technology that relies on a moth-infecting virus and nanomagnets could be used to edit defective genes that give rise to diseases like sickle cell, muscular dystrophy and cystic fibrosis. Rice University bioengineer Gang Bao has combined magnetic nanoparticles with a viral container drawn from a particular species of moth to deliver CRISPR/Cas9 payloads that modify genes in a specific tissue or organ with spatial control. Because magnetic fields are simple to manipulate and, unlike light, pass easily through tissue, Bao and his colleagues want to use them to control the expression of viral payloads in target tissues by activating the virus that is otherwise inactivated in blood.

The research appears in Nature Biomedical Engineering. In nature, CRISPR/Cas9 bolsters microbes' immune systems by recording the DNA of invaders. That gives microbes the ability to recognize and attack returning invaders, but scientists have been racing to adapt CRISPR/Cas9 to repair mutations that cause genetic diseases and to manipulate DNA in laboratory experiments.

CRISPR/Cas9 has the potential to halt hereditary disease -- if scientists can get the genome-editing machinery to the right cells inside the body. But roadblocks remain, especially in delivering the gene-editing payloads with high efficiency. The delivery vehicle developed by Bao's group is based on a virus that infects Autographa californica, aka the alfalfa looper, a moth native to North America. The cylindrical baculovirus vector (BV), the payload-carrying part of the virus, is considered large at up to 60 nanometers in diameter and 200-300 nanometers in length. That's big enough to transport more than 38,000 base pairs of DNA, which is enough to supply multiple gene-editing units to a target cell, Bao said.

"If we combine BV with magnetic nanoparticles, we can overcome this deactivation by applying the magnetic field," Bao said. "The beauty is that when we deliver it, gene editing occurs only at the tissue, or the part of the tissue, where we apply the magnetic field."

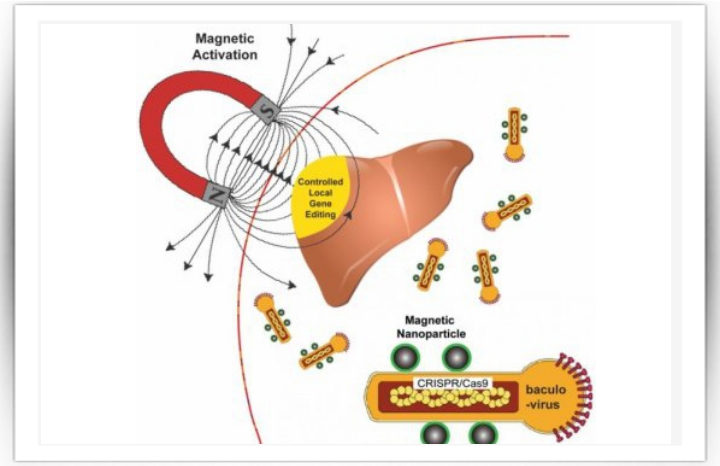

*Image Source:
https://www.sciencedaily.com/releases/2018/11/181113110359.htm

In tests, the BV was loaded with green fluorescent proteins or firefly luciferase. Cells with the protein glowed brightly under a microscope, and experiments showed the magnets were highly effective at targeted delivery of BV cargoes in both cell cultures and lab animals.

*Source: https://www.sciencedaily.com/releases/2018/11/181113110359.htm

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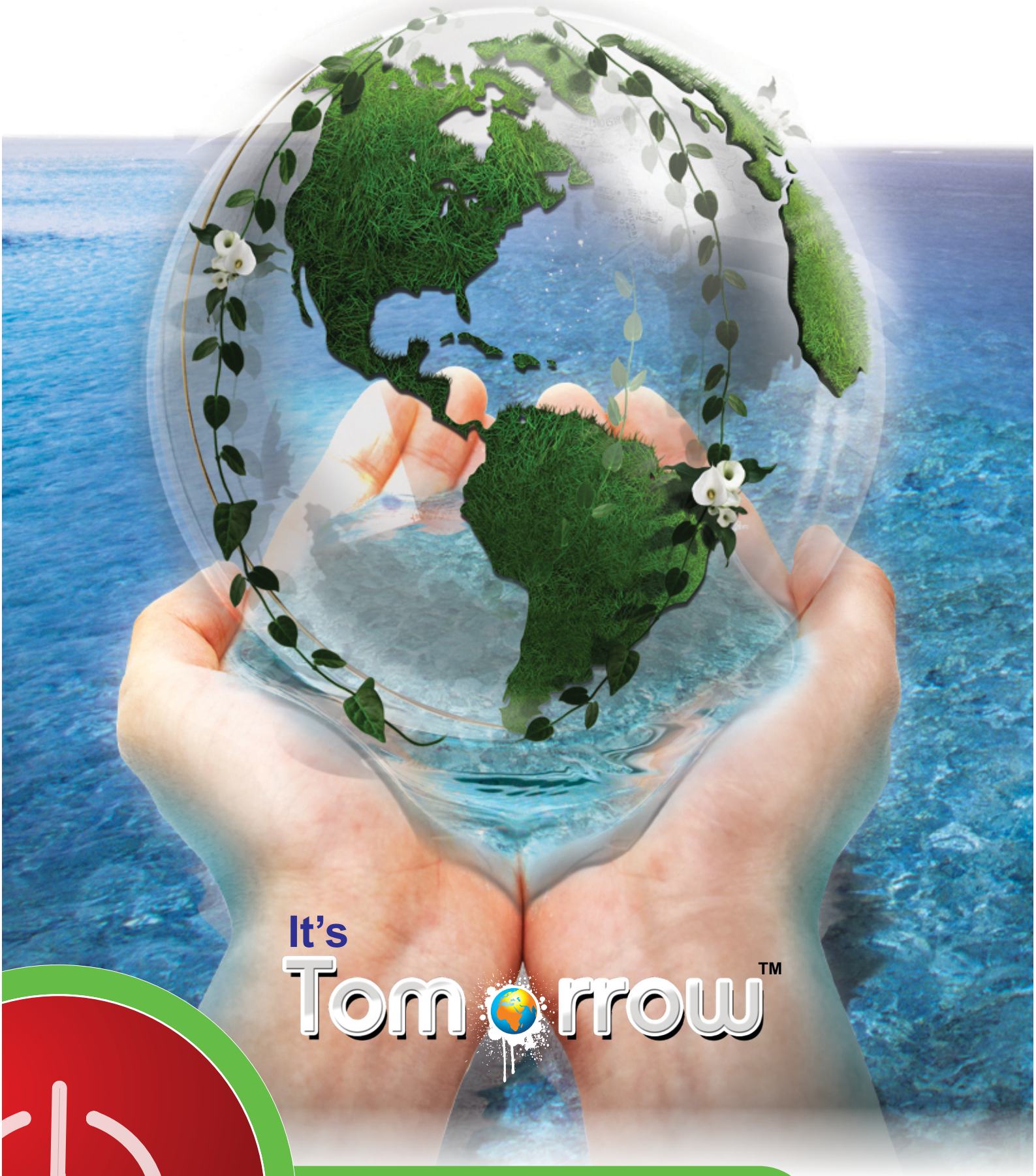

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Nanoland Ltd.
Mezzanine Floor, N. R. House, Nr. Popular House, Ashram Road, Ahmedabad - 380 009. INDIA
Tel : +91 79 27545254/5255/5256 Fax : +91 79 27545257/4167
Email : info@conservetheenergy.com
Web : www.conservetheenergy.com

/cnsrv_enrgy
/energyconserve