Conserve The Energy™

It's Tomorrow™

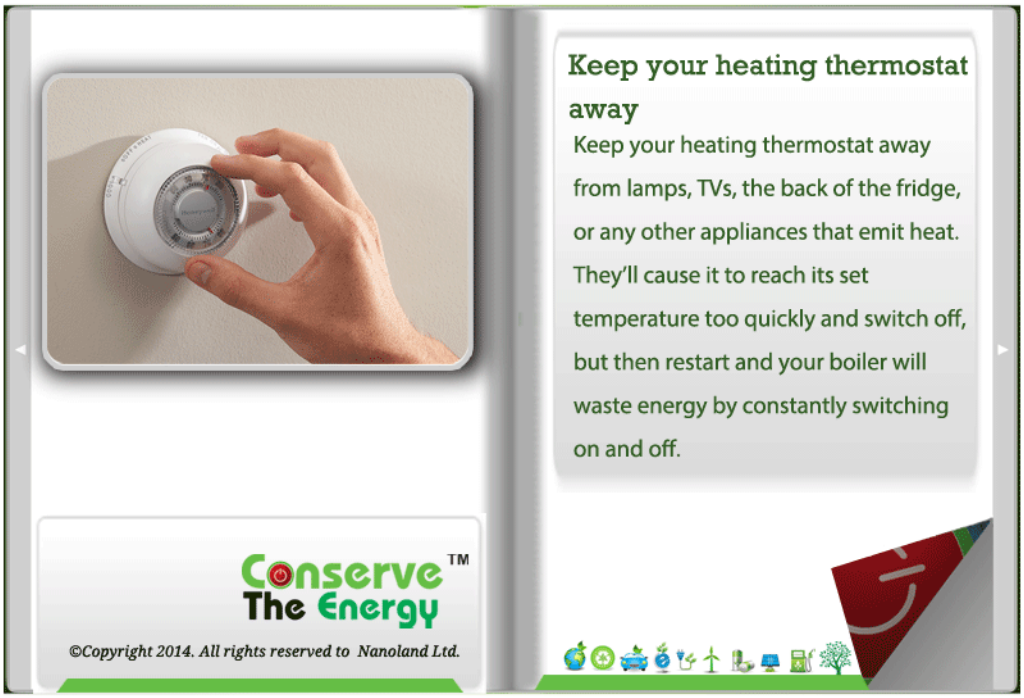
January - 2019 Issue : 27

INSIDE...

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 : Purple bacteria 'batteries' turn sewage into clean energy

Organic compounds in household sewage and industrial wastewater are a rich potential source of energy, bioplastics and even proteins for animal feed -- but with no efficient extraction method, treatment plants discard them as contaminants. Now researchers have found an environmentally-friendly and cost-effective solution. Recent studies show that purple phototrophic bacteria -- which can store energy from light -- when supplied with an electric current can recover near to 100% of carbon from any type of organic waste, while generating hydrogen gas for electricity production.

"One of the most important problems of current wastewater treatment plants is high carbon emissions," says co-author Dr Daniel Puyol of King Juan Carlos University, Spain. "Our light-based biorefinery process could provide a means to harvest green energy from wastewater, with zero carbon footprints."

The bacteria can use organic molecules and nitrogen gas -- instead of CO2 and H2O -- to provide carbon, electrons and nitrogen for photosynthesis. This means that they grow faster than alternative phototrophic bacteria and algae, and can generate hydrogen gas, proteins or a type of biodegradable polyester as byproducts of metabolism.

Which metabolic product predominates depends on the bacteria's environmental conditions -- like light intensity, temperature, and the types of organics and nutrients available. Capturing excess CO2 produced by purple bacteria could be useful not only for reducing carbon emissions, but also for refining biogas from organic waste for use as fuel.

"One of the original aims of the study was to increase biohydrogen production by donating electrons from the cathode to purple bacteria metabolism. However, it seems that

Image source: https://www.medindia.net/news/purple-bacteria-could-convert-sewage-into-clean-energy-183752-1.htm

the PPB bacteria prefer to use these electrons for fixing CO2 instead of creating H2.

Source: https://www.sciencedaily.com/releases/2018/11/181113080903.htm

Article - 2 : Graphene takes a step towards renewable fuel

Researchers at Linköping University, Sweden, are working to develop a method to convert water and carbon dioxide to the renewable energy of the future, using the energy from the sun and graphene applied to the surface of cubic silicon carbide. They have now taken an important step towards this goal, and developed a method that makes it possible to produce graphene with several layers in a tightly controlled process.

The research group has also shown that graphene acts as a superconductor in certain conditions. Their results have been published in the scientific journals Carbon and Nano Letters. Carbon, oxygen and hydrogen. These are the three elements you would get if you took apart molecules of carbon dioxide and water. The same elements are the building blocks of chemical substances that we use for fuel, such as ethanol and methane. The conversion of carbon dioxide and water to renewable fuel, if possible, would provide an alternative to fossil fuels, and contribute to reducing our emission of carbon dioxide to the atmosphere. Researchers at Linköping University have previously developed a world-leading method to produce cubic silicon carbide, which consists of silicon and carbon. The cubic form has the ability to capture energy from the sun and create charge carriers. Graphene, one of the thinnest materials ever produced, plays a key role in the project. The material comprises a single layer of carbon atoms bound to each other in a hexagonal lattice. Graphene has a high ability to conduct an electric current, a property that would be useful for solar energy conversion. It also has several unique properties, and possible uses of graphene are

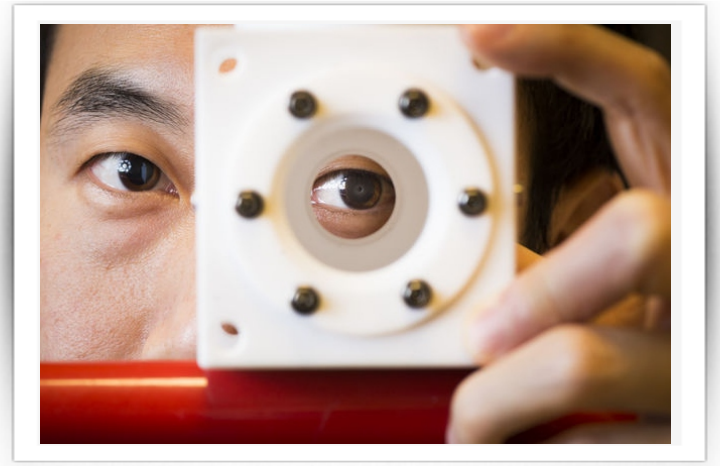


Image Source: https://liu.se/en/news-item/grafen-i-flera-lager-nyckeln-till-fornybart-bransle

being extensively studied all over the world.

Multilayer graphene has extremely promising electrical properties that enable the material to be used as a superconductor, a material that conducts electrical current with zero electrical resistance. This special property arises solely when the graphene layers are arranged in a special way relative to each other.

Source: https://www.sciencedaily.com/releases/2018/11/181107103554.htm

Article - 3 : Transforming carbon dioxide into industrial fuels

Imagine a day when -- rather than being spewed into the atmosphere -- the gases coming from power plants and heavy industry are instead captured and fed into catalytic reactors that chemically transform greenhouse gases like carbon dioxide into industrial fuels or chemicals and that emit only oxygen. A Fellow at the Rowland Institute at Harvard, Wang and colleagues have developed an improved system to use renewable electricity to reduce carbon dioxide into carbon monoxide -- a key commodity used in a number of industrial processes.

The most promising idea may be to connect these devices with coal-fired power plants or other industry that produces a lot of CO2," Wang said. "About 20 percent of those gases are CO2, so if you can pump them into this cell and combine it with clean electricity, then we can potentially produce useful chemicals out of these wastes in a sustainable way, and even close part of that CO2 cycle."

Where that old system was barely the size of a cell phone and relied on two electrolyte-filled chambers, each of which held an electrode, the new system is cheaper and relies on high concentrations of CO2 gas and water vapor to operate more efficiently -- just one 10-by-10-centimeter cell, Wang said, can produce as much as four liters of CO per hour. The new system, Wang said, addresses the two main challenges -- cost and scalability -- that were seen as limiting the initial approach.

Ultimately, Wang said, the day may come when industry will be able to capture the CO2 that is now released into the atmosphere and transform it into useful products. "Carbon monoxide is not a particularly high value chemical product," Wang said. "To explore more possibilities, my group has also

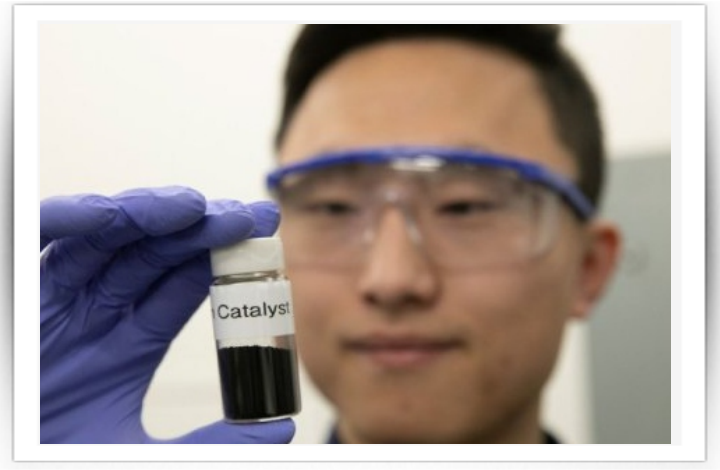


*Image Source: https://www.sciencedaily.com/releases/2018/11/181108130533.htm

developed several copper-based catalysts that can further reduce CO2 into products that are much more valuable."

*Source:https://www.sciencedaily.com/releases/2018/11/181108130533.htm

Article - 4 : Materials scientist creates fabric alternative to batteries for wearable devices

A major factor holding back development of wearable biosensors for health monitoring is the lack of a lightweight, long-lasting power supply. Now scientists at the University of Massachusetts Amherst led by materials chemist Trisha L. Andrew report that they have developed a method for making a charge-storing system that is easily integrated into clothing for "embroidering a charge-storing pattern onto any garment."

As Andrew explains, "Batteries or other kinds of charge storage are still the limiting components for most portable, wearable, ingestible or flexible technologies. The devices tend to be some combination of too large, too heavy and not flexible."

Their new method uses a micro-super capacitor and combines vapor-coated conductive threads with a polymer film, plus a special sewing technique to create a flexible mesh of aligned electrodes on a textile backing. The resulting solid-state device has a high ability to store charge for its size, and other characteristics that allow it to power wearable biosensors.

But "incorporating electrochemically active materials with high electrical conductivities and rapid ion transport into textiles is challenging," they add. Andrew and colleagues show that their vapor coating process creates porous conducting polymer films on densely-

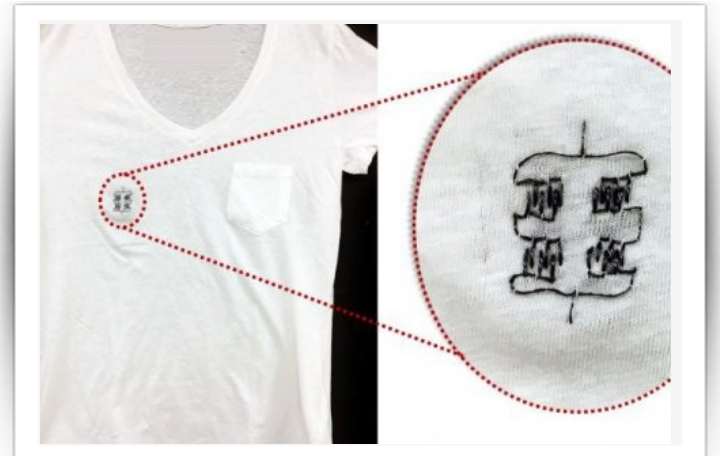


*Image Source: https://www.sciencedaily.com/releases/2018/11/181108164257.htm

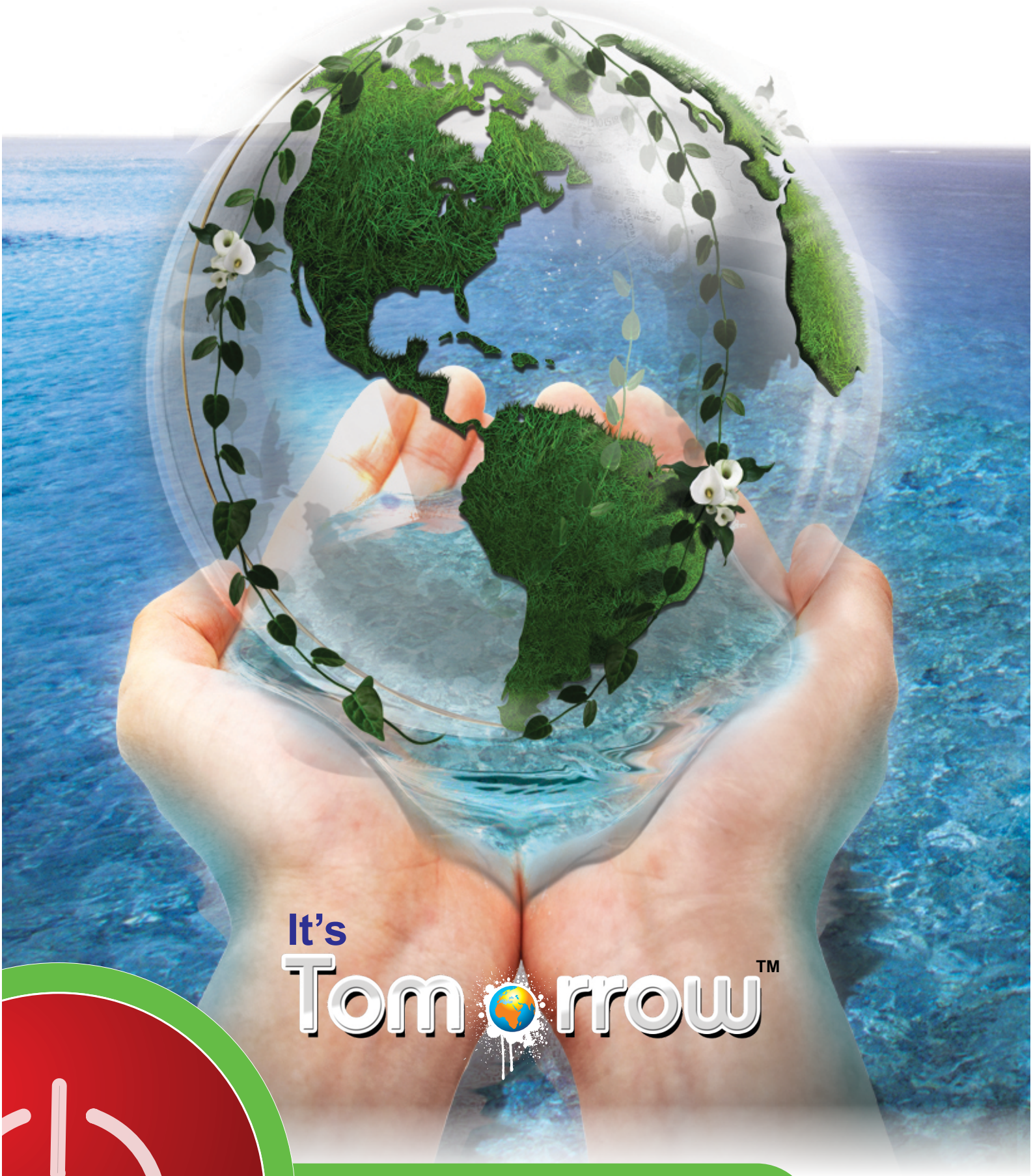
twisted yarns, which can be easily swelled with electrolyte ions and maintain high charge storage capacity per unit length as compared to prior work with dyed or extruded fibers.

*Source: https://www.sciencedaily.com/releases/2018/11/181108164257.htm

Conserve the Energy,

Save our Climate!

Conserve™ The Energy



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