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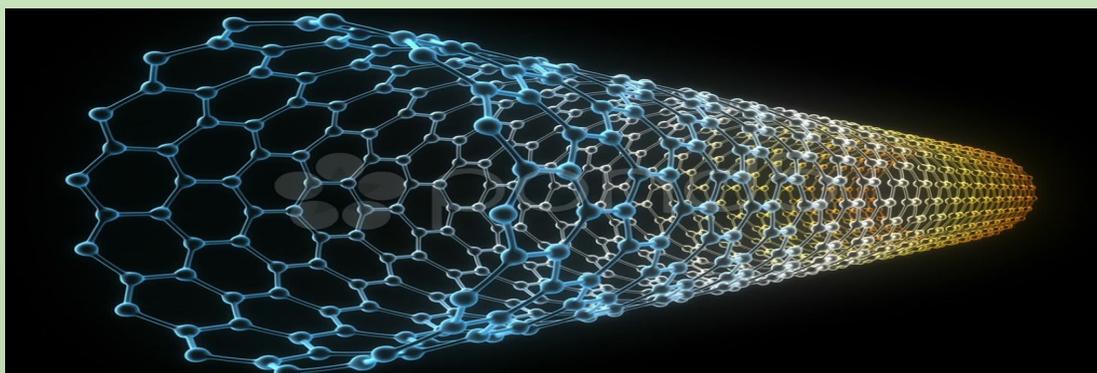
### ASTONISHING FACTS

- The largest wind turbine in the world, located in Hawaii, stands 20 storeys tall and has blades the length of a football pitch.
- World's total resource base for geothermal energy is larger than the resource base for coal, oil, gas and uranium combined.
- Tattapani, in the Balrampur district of Chhattisgarh will host India's first geothermal energy plant.
- An average wind speed of just 14mph is needed to convert wind energy into electricity; that shouldn't be too hard to come by most countries

Source : [www.worldofsolarthermal.com](http://www.worldofsolarthermal.com)



## Carbon Nanoballs – A Great Contribution to Sustainable Energy Supply



Researchers at Chalmers University of Technology have discovered that the insulation plastic used in high-voltage cables can withstand 26% higher voltage if nanometer-sized carbon balls are added. This could result in enormous efficiency gains in the power grids of the future, which are needed to achieve a sustainable energy system.

It can reduce energy losses during electric power transmission which is one of the most important factors for the energy systems of the future

The researchers have shown that different variants of the C60 carbon ball, a nanomaterial in the fullerene molecular group, provide strong protection against breakdown of the insulation plastic used in high voltage cables. The voltage in the cables has to be limited to prevent the insulation layer from getting damaged. The higher the voltage the more electrons can leak out into the insulation material, a process which leads to breakdown. Fullerenes have an unsurpassed ability to capture electrons and thus protect other molecules from being destroyed by the electrons.

Addition of a little amount of fullerene to the insulation plastic makes it capable of withstanding a voltage that is 26% higher, without the material breakdown. Being able to increase the voltage to this extent would result in enormous efficiency gains in power transmission all over the world.

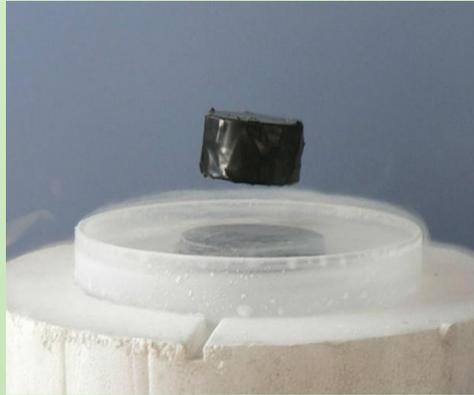
Researchers also tested a number of molecules for this purpose. The molecules were tested using several different methods, and were added to pieces of insulation plastic used for high voltage cables. The pieces of plastic were then subjected to an increasing electric field until they crackled. Fullerenes turned out to be the type of additive that most effectively protects the insulation plastic.

The next step involves testing the method on a large scale in complete high-voltage cables for alternating current. The researchers will also test the method in high-voltage cables for direct current, since direct current is more efficient than alternating current for power transmission over very long distances.

Source : *Chalmers university journals*

## Superconductivity at Room Temperature achieved

Physicists from the Max Planck Institute for the Structure and Dynamics of Matter have kept a piece of ceramic in a superconducting state at room temperature – without any cooling, disproving the widely-held assumption that materials need to be cooled to temperatures of at least -140 degrees Celsius to achieve superconductivity.



Superconducting materials have the potential to change everything that relies on electrical power, such as power grids, transportation, and renewable energy sources. This is because they are able to transport electric currents without any resistance, which means they're incredibly efficient and cost-effective to run. Yttrium barium copper oxide (YBCO) is the Ceramic material used in the experiment. Made from super thin double layers of a copper oxide material stacked in between layers

made from barium, copper and oxygen, this material is designed to allow the bonding of electrons into Cooper pairs.

These Cooper pairs of electrons are able to 'tunnel' between the alternating layers "like ghosts can pass through walls, figuratively - a typical quantum effect"- but it was thought this could only occur at super-cooled temperatures.

But physicists from Max Planck institute radiated the YBCO ceramic material with infrared laser pulses. It was

found that for a fraction of a second, the ceramic becomes superconducting at room temperature. It was for only a few millionths of a millisecond. However, the successful experiment is enough to disprove existing assumptions.

The team explained this as - The Infrared pulse had not only excited the atoms to oscillate, but had also shifted their position in the crystal as well. This briefly made the copper dioxide double layers thicker by two picometres and the layer between them became thinner by the same amount. This in turn increased the quantum coupling between the double layers to such an extent that the crystal became superconducting at room temperature for a few picoseconds.

*Source : Gizmodo*

## Indoor Farms : The Future of Agriculture

In Japan, the world's largest indoor farm produces 10,000 heads of lettuce each day with 99 percent less water and 40% less power than outdoor fields. This incredible indoor "food factory" is claiming that it can produce 100 times more heads of lettuce per day than an outdoor counterpart of the same area, and also produces 80 percent less food waste. The entire thing is stored inside a building measuring around 25,000 sq. feet.

Miyagi was chosen as the site for this farm as there were food shortages in the region and concern over the safety of growing crops in the soil north of Fukushima following the 2011 earthquake and tsunami. The building they chose for this is an old, abandoned Sony factory, but the farm has now given it new a purpose, providing a local and sustainable supply of fresh



food.

The entire thing is powered by 17,500 LED lights, specially designed for the project, which run at a wavelength that increases photosynthesis and cell division in the lettuce crops. The scientists have also shortened the day and night length as well as carefully controlled the humidity and temperature of the factory, in order to speed up the growth of the plants by two and a half times.

In outdoor farms, a lot of water is lost as it seeps through the soil and

evaporates into the atmosphere. But the enclosed factory allows the water to be collected and recycled from the environment. And the lettuce crop itself is also more efficient -the plants don't have a core, which greatly reduces food waste.

Their ultimate goal is to build more of the indoor farms around the world; where pollution, drought, flooding or climate stand in the way of food production and use the water savings to fuel the complimentary outdoor projects.

With up to 900 million people around the world currently suffering from starvation, it's an exciting and much-needed breakthrough that paves the way for the farms of the future.

*Source : weburbanist.com*

## Energy Entrepreneur : Dr. K.R. Sridhar

**B**loom energy, a forerunner in the field of sustainable and efficient energy solution provider is changing the way the world generates and consumes energy. Bloom's unique on-site power generation systems utilize an innovative new fuel cell technology with roots in NASA's Mars program. Derived from a common sand-like powder, and leveraging breakthrough advances in materials science, its technology is able to produce clean, reliable, affordable power practically anywhere from a wide range of renewable or traditional fuels. Its Energy Servers are among the most efficient energy generators on the planet; providing a clear path to energy independence and dramatically lower greenhouse gas emissions.

The Cofounder and CEO of the company Dr. KR Sridhar is a Mechanical Engineering graduate from NIT



Trichirappalli. He gained an M.S in nuclear engineering and a PhD in mechanical engineering from the University of Illinois at Urbana-Champaign. His Laboratory was asked by NASA to undertake research into how life could be made sustainable on Mars. The team built a device that could use solar power and water obtained from the planet to power a reactor cell that made oxygen to breathe and hydrogen to power vehicles. In 2001, Sridhar was a

co-founder of Ion America, later to become Bloom Energy, with a mission to make clean, reliable energy affordable for everyone on earth. In 2010, Bloom Energy launched a new energy efficient and environmental friendly fuel cell known as the Bloom Box. Currently natural gas (but theoretically any other fuel) and oxygen are run through a stack of cells, producing electricity. Bloom's Energy Servers have helped its customers generate millions of kWhs of electricity and eliminate millions of pounds of CO<sub>2</sub> from the environment. Companies such as Adobe Systems, Ebay, Google, FedEx, Wal-Mart and Yahoo have already purchased larger sized boxes. From humble beginnings on Mars, Sridhar's company Bloom Energy is now changing the Earth for the better.

*Source : bloomenergy.com*

## Old Plastic Bottles transformed into Waterproof Paper

**A** team of Mexican entrepreneurs has found a way to save 20 trees and 56,000 litres of water for every ton of paper produced - simply make it out of recycled plastic bottles instead. They developed a system that can convert used PET (polyethylene terephthalate) bottles into a type of mineral paper that is waterproof and photodegradable.

Developed by a company called Cronology, the new technique claims to be 15 percent cheaper than traditional paper manufacturing methods because it does not use water or chemicals such as chlorine, making it more environment friendly.

Mineral paper is also known as petapaper or stone paper. It is stronger than the standard one, unbreakable with hands, is waterproof, has the quality of being photodegradable and



only absorbs the necessary amount of ink when printing. It meets the quality standards required to be used to print books, general stationary and boxes as well.

The process works by first breaking plastic bottles down into bead like pellets with pieces of calcium carbon and stone. The resulting pellet mixture is then heated to more than 100 degrees Celsius and rolled out into

large sheets of paper using a roller machine.

It is not the first time that plastic has been turned into paper. In Spain and Taiwan companies are already manufacturing paper but the Cronology system is four times cheaper than other methods.

It takes 235 kilograms of PET bottles in order to make one ton (907 kilograms) of mineral paper but the process also saves those bottles from ending up in landfill.

The only downside is that you can't write on the resulting paper with ink gel because it contains alcohol. But regular ink works fine.

*Source : Gizmag*

### A promising solution for Ocean plastic

#### Water Wheel Facts

The Inner Harbor Water Wheel is capable of removing 50,000 lbs. of trash every day.  
On a sunny day the solar panels can produce 30 kilowatt-hours of electricity. That's enough to power a typical Maryland home for one day.

#### Water Wheel Parts

- 1 Two trash containment booms direct trash and debris to the front of the Water Wheel
- 2 The debris raking system helps to move trash and debris to the front of the conveyor belt
- 3 The conveyor belt lifts trash and debris from the water and deposits it into the dumpster barge
- 4 The sail fabric cover protects the Water Wheel from wind and rain
- 5 The water wheel harnesses the current of the river to turn the conveyor belt
- 6 The dumpster barge stores trash and debris
- 7 The solar panel array provides additional power to turn the water wheel

### COMIC SENSE

### ANSWER YOURSELF??

- ◆ Can we really supply 100% of our energy needs without fossil fuels?
- ◆ Why do wind turbines seem to spend so much time idle?
- ◆ What is the lifecycle carbon impact of wind or solar?
- ◆ What is Green Energy Act ?How can this act allow all communities to generate clean energy?

### QUIZ

1. Which developing country derives the most energy from solar power?
2. What fraction of the energy in burning coal reaches the consumer as electricity?
3. Name the two most toxic chemicals used in petrol that cause brain damage and leukemia?

Send your entries to  
[mnit.energyheadlines@gmail.com](mailto:mnit.energyheadlines@gmail.com)  
Winner entries to win exciting prizes.

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