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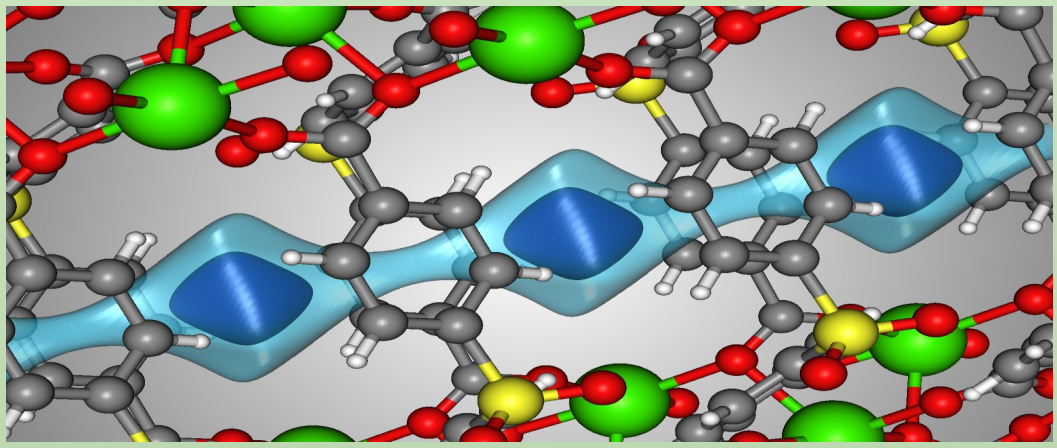
This Issue :

Trending

- Renewable energy now supplies almost one quarter of world's power needs.
- Uttar Pradesh has made the Guinness World Record by planting 50 million saplings in just 24 hours.
- Researchers from University of New South Wales has set a new world record by building photovoltaic cells that can harvest 34.5 percent of the Sun's energy without concentrators.
- Solar price in India dropped to around parity with coal for the first time ever, hitting 4.34 rupees per kWh this year.

Source: Internet

MOF: Radioactive Nuclear Fuel Trapper



All energy-generating processes end up taking a toll of some kind on the environment, but the impact is considerably harder to manage with nuclear power, which generates dangerous and long-lived radioactive waste. Now scientists have come up with a new material that could make nuclear fuel recycling cleaner, cheaper, and more efficient.

Metal Organic Frameworks have tiny pores inside, often just one molecule in size, which enable them to separate and trap gaseous mixtures by selective adsorption. Ordinarily, capturing these gases to recycle them requires cryogenic temperatures far below freezing point, and that's both expensive and energy-intensive to maintain. The appeal of a MOF material is- it could do the same job at an ambient temperature.

A team of computational chemists worked through 125,000 possible MOFs using seven different characteristics to predict how each one would fare at trapping xenon. The simulations ended up identifying a material called SBMOF-1 as a strong contender for trapping the gas effectively, so they put it through its paces in lab experiments to further test its suitability.

Extra coding innovations were able to flag unsuitable materials more quickly, otherwise the process could've taken a supercomputer several weeks to complete.

Further study will be required before SBMOF-1 can be cleared for duty and actively used to recycle nuclear fuels, but the research team thinks that this material and other MOFs like it could have further applications in capturing other noble gases.

Nuclear fuel recycling is not an idea that every country subscribes to. Fears over safety and cost do not allow US to recycle its nuclear waste, though there are recycling plants in the UK, France, Japan, Russia, and India.

But if discoveries like the one that led to SBMOF-1 can help make the process cheaper and more reliable, it's likely to become a more popular option for countries generating nuclear power in the future.

Source : Sciencedirect.com

Scientists turn CO_2 into Rock to combat Climate Change

The pioneering experiment in Iceland mixed CO_2 emissions with water and pumped it hundreds of metres underground into volcanic basalt rock, where it rapidly turned into a solid.

Experts have long seen carbon capture and sequester (CCS), as a potentially significant way to combat climate change. The idea is that storing CO_2 emissions underground would prevent the greenhouse gas from entering the atmosphere, but previous efforts have made little progress. Most experiments involve pumping CO_2 into sandstone or deep aquifers, though there are concerns that the gas could eventually escape and re-enter the atmosphere; whether through human error or seismic activity.

In contrast, the Carbfix project at Iceland's Hellisheidi plant — the world's largest geothermal facility, sought to solidify the CO_2. Lab experiments showed that, unlike the sedimentary rocks that most other projects have used for injection, the local basalt contains plenty of calcium, iron and magnesium, which are needed to precipitate out carbon. Experiments showed that large amounts of water would also have to be added to make the reaction go-another departure from previous projects, which have just pumped down pure CO_2.

Essentially scientists have accelerated the natural phenomenon. In nature, when basalt is exposed to CO_2 and water, a series of natural chemical reactions takes place, and the carbon precipitates out into a whitish, chalky mineral (calcite).

In 2012, scientists began pumping 250 tons of CO_2 (mixed with water and hydrogen sulphide) into basalt about 1,500 feet below ground. Hydrogen sulphide was used as tracer chemical to check leakage. Within two years, 95% of the carbon injected into the basalt below the plant had solidified into stone. Encouraged by the success, the team has scaled up the project & will be burying 10,000 tonnes of CO_2 each year. Carbon capture is not the silver bullet, but it can contribute significantly in reducing carbon dioxide emissions.

Source : The Hindu

Chernobyl to become a Giant Solar Farm

The Ukrainian government has announced a plan to turn the area surrounding Chernobyl - the site of one of the worst nuclear meltdowns in history - into a solar energy farm, by constructing a series of solar panels inside the exclusion zone.

Thirty years ago, Chernobyl, a city roughly 70 miles from Kiev, was rendered toxic after a nuclear melt-down triggered a mass evacuation. Now, all these years later, a large section of roughly 2,600 square km of land in and around Chernobyl is still unsuitable for human settlement.

Not only would this plan allow the country to use a giant chunk of radio-active land that's unfit for human settlement, but it would also provide a cheaper source of reusable energy. The Ukrainian government said more than 1,000MW of solar and 400MW of other renewable energy (from energy crops) could be generated.

Chernobyl's exclusion zone has a few advantages for solar energy. First, because the land can't be used for anything else, it's cheap and plentiful. Hours of sunshine in the Chernobyl area compare favorably with southern Germany, one of the largest solar producers in the world. The electrical transmission infrastructure, normally expensive to install, is still in place from the former nuclear plant. Chernobyl is also near Kiev, a city with nearly 3 million people and the largest power demand in the Ukraine. Additionally, there are a lot of people trained to work at power plants.

Right now, Ukrainian officials are trying to lock down the funds needed for the expensive project. They're in talks with two US investment firms and four Canadian energy developers. There's no word on how the construction of the solar panels would play out just yet, but judging from a report from earlier this year that found that milk produced at the edge of the exclusion zone contains roughly 10 times the amount of acceptable radiation, it's going to be a serious challenge to ensure the safety of workers even outside the abandoned city.

Source : www.theguardian.com

Bacterium that inhales CO_2, produces Energy

Harvard Chemist Daniel Nocera has announced that he and his colleagues have engineered a bacterium that has made it capable of taking in carbon dioxide and hydrogen, and excreting several types of alcohol fuels, along with biomass that can be burnt and used as an energy source.

Nocera achieved a level of notoriety five years ago, when he and his team announced that they had created an artificial leaf that could be used to generate hydrogen for use as a fuel. However, the idea did not lead to hydrogen fuel cells displacing gasoline in automobiles, as he had hoped. So this time, he has set his sights on providing a fuel source for those more in need — parts of India where there is still no electricity.

The new bacterium, which has been named Ralston Eutropha was first caused (via genetic engineering) to take in carbon dioxide and hydrogen, which it used to produce adenosine triphosphate (ATP), as is done with plants. The team then took the work further by inserting more genes to cause the bacterium to then convert the ATP to various types of alcohols (isopentanol, isobutanol, isopropanol) which were then excreted.

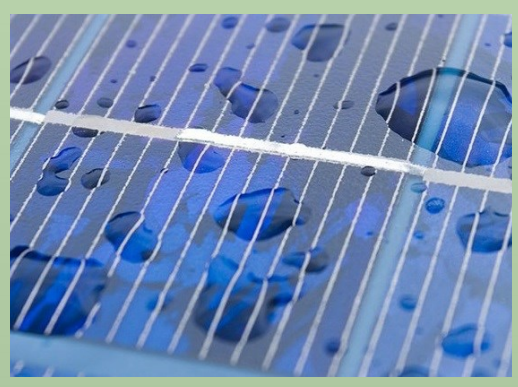
Researcher claimed that when the bacterium was allowed to reproduce, clusters of them were capable of producing alcohols at 6% efficiency and biomass at 10.6% efficiency. Plants in comparison are about 1 % efficient at converting sunlight and carbon dioxide into biomass.

Noting that some might see masses of such bacteria pulling carbon dioxide from the atmosphere as a possible solution to reducing global warming, researcher suggested that was not the most likely outcome—he envisions people in need burning the alcohol and biomass as a fuel source, which would of course return the carbon dioxide back into the atmosphere—making it a carbon-neutral resource. Researcher is currently looking for investors to bring the technology to parts of India where it is so badly needed.

Source : www.forbes.com

All Weather Solar Panel generates Electricity from Rain

Solar power is making huge strides as a reliable, renewable energy source, but there's still a lot of untapped potential in terms of the efficiency of photovoltaic cells and what happens at night and during inclement weather. Now a solution has been put forward in the form of producing energy from raindrops.



Key to the new process is graphene: the 'wonder' material. Because raindrops are not made up of pure water, and contain various salts that split up into positive and negative ions, a team from the Ocean University of China in Qingdao proved that power can be harnessed via a simple chemical reaction. Specifically, they used graphene sheets to separate the positively charged ions in rain (including sodium, calcium, and ammonium) and in turn generated electricity.

Early tests, using slightly salty water to stimulate rain, have been promising: the researchers were able to generate hundreds of microvolts and achieve a respectable 6.53 percent solar-to-electric conversion efficiency from their customized solar panel.

For the experiment, the team used an inexpensive, thin-film solar cell called a dye-sensitized solar cell. After adding a layer of graphene to the cell, it was put on a transparent backing of indium tin oxide and plastic. The resulting 'all-weather' solar cell concept was then equipped to produce power from both sunshine and the rain substitute.

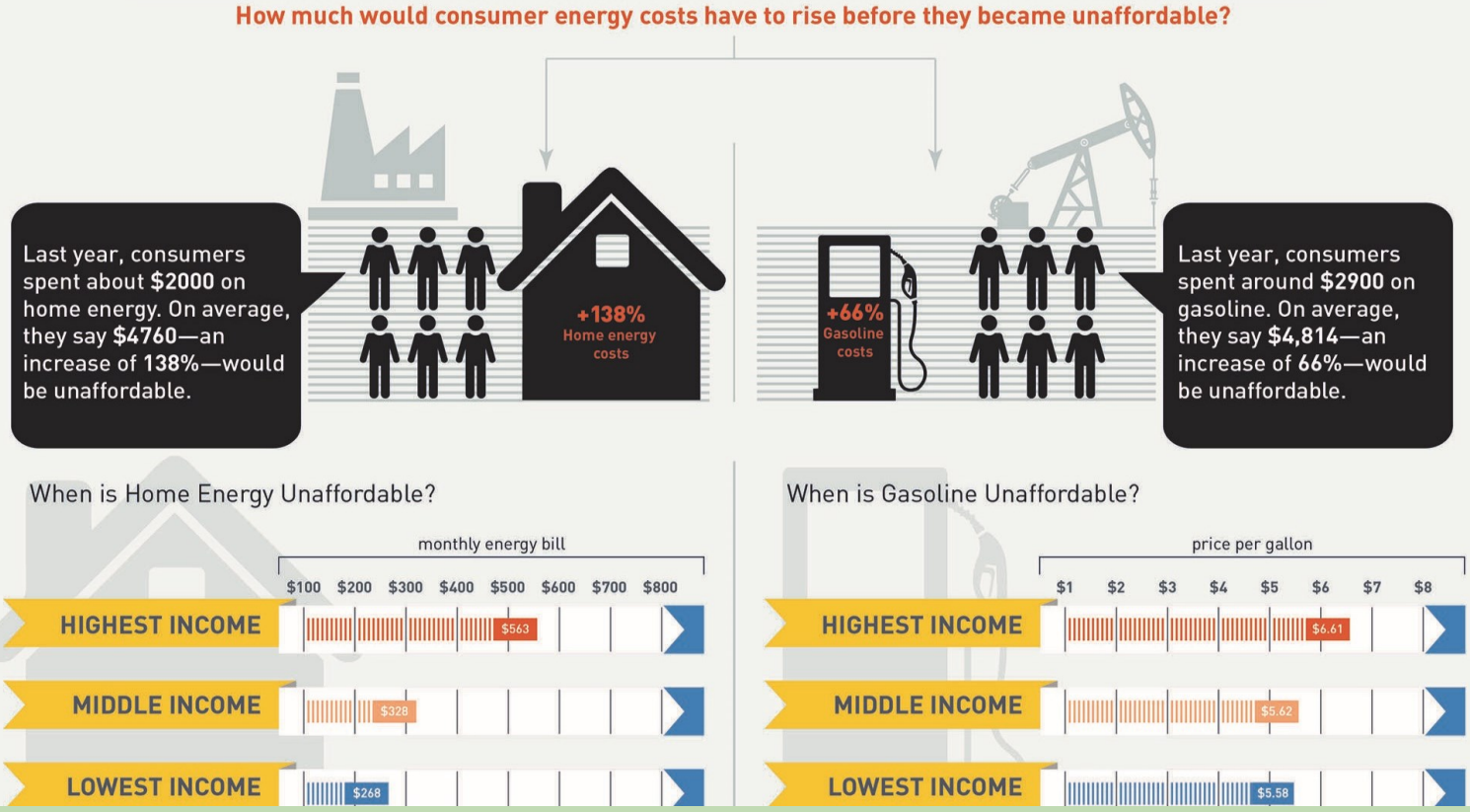
Scientifically, positively charged ions are binding to the ultra-thin layer of graphene and forming a double layer (technically referred to as a pseudo capacitor) with the electrons already present. The potential energy difference between the two layers is strong enough to generate an electric current.

The experiment is still just in the 'proof of concept' phase, so there's work to be done, but the researchers hope their findings can guide the design of future all-weather solar cells and contribute to the growing influence of renewable energy.

Source : sciencealert.com

Energy Costs: How Much is Too Much?

How much would consumer energy costs have to rise before they became unaffordable?



COMIC SENSE

ISHRAE MNIT CHAPTER

Energy Club, MNIT Jaipur has reinstalled ISHRAE (Indian Society of Heating, Refrigerating and Air Conditioning Engineers) students chapter in the college. Interested students can mail to Student Chapter President Mr. Ranaveer Pratap Singh at 2015rme9516@mnit.ac.in or contact Energy Club team for more information.

QUIZ

1. What is the name of the mineral to which the CO_2 converts after pumping 1500 feet below the ground?
2. Which bacterium has been genetically modified to inhale carbon dioxide and generate energy?
3. Name five countries which operate re-cycling plants for nuclear waste?

Send your entries to ***energyclub@mnit.ac.in***

Winning entries to get exciting prizes.

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