

Fresh

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For the Better

HUMAN HEALTH | ENVIRONMENTAL HEALTH

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FOR CLEANER
ENVIRONMENT
AND HEALTHY
WORLD



E D I T O R I A L

Dear Reader

June is the month that brings many of us joys in all forms – the much needed rains from the overbearing heat, and of course, it's back to school for all our children! Of course, these joys are usually met with mixed responses!!

Another event that June brings is World Environment Day. Although it seems nice that we choose to select one day of the year just for Mother Nature, it has now come down to the fact that we need to observe every day as World Environment Day. Merely having Earth Hour once every 2 months really does not solve anything, but merely hypes the entire event, only to be forgotten the following morning.

There is so much we can do to really make the event as World Environment Year – by observing Earth Hour every day, make it a point to start rain-water harvesting for every household, following strictly the 3R's – Reduce, Reuse and Recycle.

The recent disaster at the Gulf of Mexico makes us all cringe with disbelief and utter sadness as we see flora and fauna ravaged by the oil spill. But we don't need to such images to make us aware of the intensity of the problem – take a closer look at home. Our beaches ravaged with plastic and effluents, the Ganges – the most sacred river of our country – has been reduced to a toxic carrier.

Let us take steps – rather take an oath – to look after our environment and not take it for granted. Remember, Climate Change is a reality, and not just fiction. The disasters you see today – surprise tsunamis, El Nino effects may be treated as a "freak of nature". But very soon, they will be a permanent stay on our weather radar.

Make that difference now. Every little thing we do today will eventually turn out to be For The Better



WHAT'S Fresh^{inside...}

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Rain....Rain.....No Acid Rain....!!

"Acid rain" is a broad term used to describe several ways that acids fall out of the atmosphere. A more precise term is acid deposition, which has two parts: wet and dry.

Wet deposition refers to acidic rain, fog, and snow. As this acidic water flows over and through the ground, it affects a variety of plants and animals. The strength of the effects depend on many factors, including how acidic the water is, the chemistry and buffering capacity of the soils involved, and the types of fish, trees, and other living things that rely on the water.

Dry deposition refers to acidic gases and particles. About half of the acidity in the atmosphere falls back to earth through dry deposition. The wind blows these acidic particles and gases onto buildings, cars, homes, and trees. Dry deposited gases and particles can also be washed from trees and other surfaces by rainstorms. When that happens, the runoff water adds those acids to the acid rain, making the combination more acidic than the falling rain alone.

Prevailing winds blow the compounds that cause both wet and dry acid deposition across state and national borders, and sometimes over hundreds of miles. Scientists discovered, and have confirmed, that sulfur dioxide (SO₂) and nitrogen oxides (NO_x) are

the primary causes of acid rain. In the US, About 2/3 of all SO₂ and 1/4 of all NO_x comes from electric power generation that relies on burning fossil fuels like coal.

Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. Sunlight increases the rate of most of these reactions. The result is a mild solution of sulfuric acid and nitric acid.

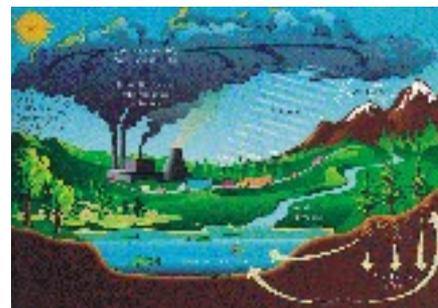
Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. Sunlight increases the rate of most of these reactions and results in a mild solution of sulfuric acid and nitric acid. SO₂ and NO_x gases and their particulate matter derivatives, sulfates and nitrates, contribute to visibility degradation and harm public health.

Understand acid deposition's causes and effects

To understand acid deposition's causes and effects and track changes in the environment, scientists from EPA, state governments, and academic study acidification processes. They collect air and water samples and measure them for various characteristics like pH and chemical composition, and they research the effects of acid deposition on human-made materials such as

marble and bronze. Finally, scientists work to understand the effects of sulfur dioxide (SO₂) and nitrogen oxides (NO_x) - the pollutants that cause acid deposition and fine particles - on human health.

To solve the acid rain problem, people



need to understand how acid rain causes damage to the environment. They also need to understand what changes could be made to the air pollution sources that cause the problem. The answers to these questions help leaders make better decisions about how to control air pollution and therefore how to reduce - or even eliminate - acid rain. Since there are many solutions to the acid rain problem, leaders have a choice of which options or combination of options are best. The next section describes some of the steps that can be taken to reduce, or even eliminate, the acid deposition problem.





Clean up smokestacks and exhaust pipes

Almost all of the electricity that powers modern life comes from burning fossil fuels like coal, natural gas, and oil. acid deposition is caused by two pollutants that are released into the atmosphere, or emitted, when these fuels are burned: sulfur dioxide (SO₂) and nitrogen oxides (NO_x).

Coal accounts for most US sulfur dioxide (SO₂) emissions and a large portion of NO_x emissions. Sulfur is present in coal as an impurity, and it reacts with air when the coal is burned to form SO₂. In contrast, NO_x is formed when any fossil fuel is burned.

There are several options for reducing SO₂ emissions, including using coal containing less sulfur, washing the coal, and using devices called scrubbers to chemically remove the SO₂ from the gases leaving the smokestack. Power plants can also switch fuels; for example burning natural gas creates much less SO₂ than burning coal. Certain approaches will also have additional benefits of reducing other pollutants such as mercury and carbon dioxide. Understanding these "co-benefits" has become important in seeking cost-effective air pollution reduction strategies. Finally, power plants can use technologies that don't burn fossil fuels. Each of these options has its own costs and benefits, however; there is no single universal solution.

Similar to scrubbers on power plants, catalytic converters reduce NO_x emissions from cars. These devices have



been required for over twenty years in the US, and it is important to keep them working properly and tailpipe restrictions have been tightened recently. EPA has also made, and continues to make, changes to gasoline that allows it to burn cleaner.

Take action as individuals

It may seem like there is not much that one individual can do to stop acid deposition. However, like many environmental problems, acid deposition is caused by the cumulative actions of millions of individual people. Therefore, each individual can also reduce their contribution to the problem and become part of the solution. One of the first steps is to understand the problem and its solutions.

Individuals can contribute directly by conserving energy, since energy production causes the largest portion of the acid deposition problem.

Complete offerings for environmental testing



TWO ANALYZERS IN SINGLE SYSTEM

Ozone Precursor's Analysis

Environmental Protection Agency (EPA) is responsible for maintaining clean air. Six parameters are measured routinely in ambient air: SO_x, NO_x, PM₁₀, Pb, CO and ozone. Clean Air Act was expanded to include volatile organic compounds (VOCs) that contribute to the formation of ground-level ozone. These measurements are implemented through Photochemical Assessment Monitoring Stations (PAMS). Similar recommendations have also been made in Europe following the 1992 Ozone Directive and United Nations Economic Commission for European protocol on controlling VOC

emissions. PerkinElmer, in conjunction with the U.S. EPA, developed an analyzer and methodology for collecting and automatically measuring C₂-C₁₁ without the use of liquid cryogen.

Air Toxics Analysis

The PerkinElmer Air Toxics Analyzer integrates several analytical techniques into a single, unified system solution, performing tube-based sampling in accordance with established methodologies such as U.S. EPA Method TO-17.

Both air toxics and ozone precursor analyses can now be performed on the same thermal desorber.

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Solar Energy & Photovoltaic Cells

The Future of Clean Energy

Photovoltaic is the other name for Solar cells, photovoltaic cells are responsible for producing energy out of sun light it receives. Photovoltaic or solar cells are made of special materials which are semi-conductors. These semi-conductors produce electricity when sun light is falls onto its surface. Solar electric cells are simple cells to use, they do not require anything but sun light to operate, they are long lasting, reliable and easy to maintain. Normally solar panels life time is twenty five years.

How photovoltaic cells work, and what are there types.

There are many types of solar cell technologies which are under development, but four of them are most commonly used, these technologies are crystalline silicon, thin films concentrators and thermophotovoltaic solar cell technologies. These cells are integrated to other solar power plant components to make electricity available.

Crystalline Silicon:

Crystalline silicon cells are quite widely used in most solar power plants. These types of cells contain two layers, positive layer and negative layer just like in most



semiconductors. Positive layer exist on the top side whereas negative layer exists on bottom. Electric field is created with in

these layers. Photons from sun light strikes on semiconductors in result electrons are released, electrons are electric charge. This electricity is transferred as direct current (DC) in panel.

There are some cells available which are made from polycrystalline silicon, these type of cells are made of multiple but small in size silicon crystals, these kind of cells are relatively cheaper to be produced but there efficiency is compromised, where as single silicon crystal cells have better performance.

Applications of silicon solar cell

Ordinary silicon cells are smaller in size hence produce small amount of electricity. One silicon cell can be used for powering up calculator or wrist watch. To produce enough energy from these types of cell for lightening up entire home modules of silicon cells are require to be



made in which these cells are connected together. These modules are building blocks for solar power. More and more modules are connected together for increasing solar electric power capacity. Arrays of modules are made for power generation in satellites.

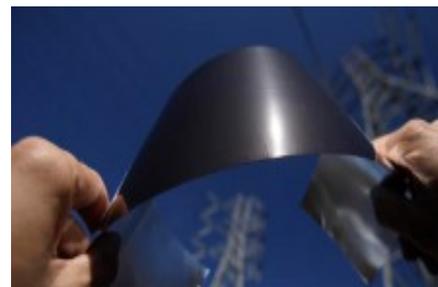
Thin Film

Thin film solar cells are simple, durable lighter and easier to assemble when we compare it with silicon module solar cells.

Amorphous is used to build best quality thin film cells. In these form of solar cells atoms arrangement is not in particular order. It is very efficient type of cell; it can convert over 90% of usable solar energy to electricity when it is exposed to light only by using amorphous silicon thin film cell which is only one micron thick. Thin film cells have advantage of being cost effective, they are required lesser amount semiconductor materials.

Application of Thin Films

These types of cells are not produced individually, but they are developed in modules and then joint together to frames and rest of the plant. Thin layers of semiconductors are used to manufacture thin films by using backing materials like plastic or glass. These backing materials are directly coated with anti-reflected materials and protective layers. Thin films are designed to match the shape of backing materials; this



enabled these types of cells to be extremely flexible in using in innovative and different shapes.

Concentrators

One can easily understand the working of concentrator cells, they works just as optical lens do. Concept is very much same as in magnifying glass. In concentrator cells light is concentrated using lens to fall on solar cells to produce

maximum energy as possible. By using concentrator cells lights intensity is increase by targeting on certain area, which in result increases electricity production.

Most of concentrator cells produced these days are made up of crystalline silicon material. But there are materials like gallium arsenide and gallium indium phosphide have proven to be much more effective in performance when compare with silicon in solar cells, there are chances for these cells will increase in use in future.

Application of Concentrator cells

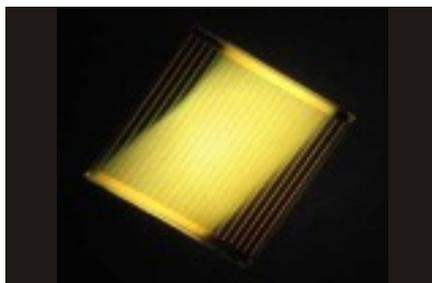
Concentrator cells are widely used in high tech industries like space and satellites etc, concentrator cells are reliable cells that's why these cells used in such sensitive and expensive space operations. These cells produce way more energy even by using low quality and less expensive semiconductors materials comparing other solar electric cells.



A normal concentrator cell is consist of lens which help focusing sun on perfect spot of cell, assembly of solar cell, device to waste of extra heat, wires for connectivity etc. These units are capable of combining with other units of different shapes and sizes to form bigger modules. Concentrator cells best works in direct sunlight, dry climates. Tracking devices must be used with these types of cells so that they can manage to keep their direction towards sun.

Thermophotovoltaics

Thermophotovoltaics cell uses different technology to produce electricity. Thermo- means heat, these cells converts

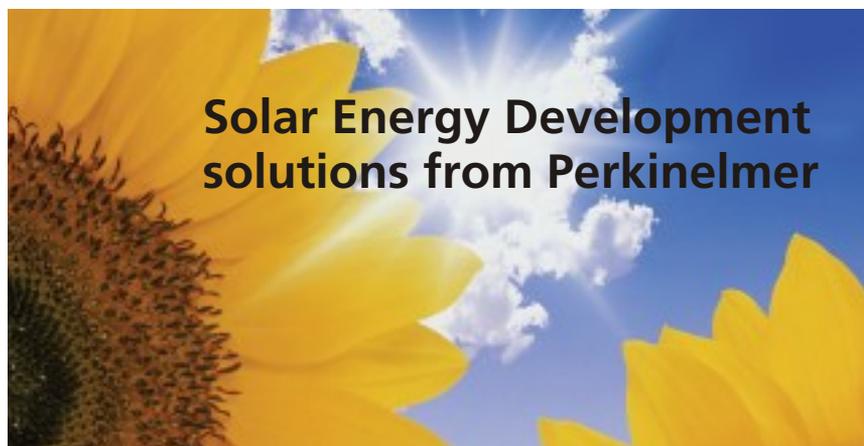


heat into electricity; rest of it works as same as photovoltaic cells which converts light into electricity. The only difference between thermo-photovoltaic and photovoltaic is that thermo photovoltaic cells uses semiconductor which are designed for long wavelength, invisible light like infrared rays released by hot objects. This way of generating electricity is very neat and clean and also simpler to

what we experience in power generation using generators, steam turbines etc.

Applications for Thermophotovoltaic Cells

These kinds of cells are very useful as they do not require much of maintenance works. They cannot only convert heat energy from sun into electricity but can also convert heat from any source into electric energy. Heat sources like fuel combustions, combustions of gasses etc. thermophotovoltaic cells like all other types of solar cells do not release any by product which can harm environment, that's why they are clean sources of energy. Thermophotovoltaic cells can be used in furnaces in future to produce their own electricity, can also be useful in battery charging and power generators.



Applications:

- Purity Measurements of Si, semiconductor materials, process gases, wet chemicals
- Crystallinity measurement
- Reflectance
- Band gap energy
- Coating durability
- Ageing behavior
- Waste management & quality control



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Oil Spilling Hazardous To Environment



Tarred beaches, dead and dying wildlife, damaged fisheries, contaminated water supplies. These are the short-term effects of an oil spill. In the long-term, toxic materials from oil can remain in the water and on the land for many years. They can build up in the food chain to lethal levels, and destroy or disrupt an area's ecosystem.

How Oil Spills Occur:

Petroleum is used as a vehicle fuel, heating source for homes and industry, for electricity generation, and as a feedstock for the chemical industry. Because of the huge demand for oil, enormous quantities are moved from production areas to where the oil is used. Oil is pumped from the ground, refined, transported and stored. There are many steps in this process during which oil can spill from well heads, drill rigs, tankers, pipelines and storage tanks. Oil may leak from ocean-going ships during accidental and deliberate spills. Spills can happen on land or

water when oil is incorrectly handled, there are railway or truck accidents, tankers or barges collide, the insides of tankers are washed, and when natural oil deposits seep. Sometimes when people change the oil in their cars, they dump the used, dirty oil on the ground or down the storm sewer. The rain carries the oil with the metals and particles from the car engine into streams and creeks. If you added up all the oil dumped on the ground in a year, it would equal or surpass a serious oil tanker spill.

Natural Seepages:

Not all spills are man-made. Crude oil is made by the earth from decayed plants and animals which lived millions of years ago. Oil has been in the environment for a long time. Some oil lies below the ocean floor and can seep into the ocean through cracks. As much as 1.5 million barrels of oil may enter the ocean from natural seeps each year. When these leaks occur, as when spills occur, natural organisms

and chemical processes act to break down the oil over time. This process is called natural bio remediation. What Happens When Oil Spills: When oil spills and mixes with water it can contaminate drinking water, kill fish and poison wildlife. Just one quart of oil may pollute up to 150,000 gallons of water! Oil is harmful to shellfish, finfish, marine mammals and waterfowl who live near the spill. Oil spills are ugly and are expensive to clean up. In addition, damage to fisheries places a hardship on those who make their living by fishing. When oil enters the ocean it quickly begins to change and disperse. Though oil is toxic, it becomes less so with time. Winds and waves help spread and disperse the oil. Some oil will evaporate. Some will form into tar balls and sink to the bottom where they may remain for a long time, slowly releasing hydrocarbons into the water. Bacteria in the water attack and digest the oil. If people act quickly after the spill, they can scoop up some of the oil and stop

it from causing worse damage to the environment.

Effects on the Food Chain:

Each tier of the marine food chain can be affected by an oil spill. Oil floating on the water may contaminate plankton (very small, swimming or floating plants and



animals). When small fish eat these plankton, they also eat the oil. Bigger fish, bears and humans who eat these fish will ingest oil too. Marine animals and birds can eat oil or it can get on their fur and feathers. When oil gets on a bird's feathers, the feathers lose their insulation capability and the bird can't adjust its body temperature and dies. Oil may obstruct the germination and growth

of marine plants.

Several serious oil spills have brought attention to the damage that can result from oil spills. Although the war in the Middle East in the early months of 1991 was brief, it left behind a damaged environment. Huge quantities of oil (2.5 to 4 million barrels) were dumped into the Persian Gulf. It was the largest oil spill in history. The oil may have destroyed or severely disrupted the area's marine ecosystem. The oil covered some 600 square miles of sea surface and blackened 300 miles of coastline..

Because this oil spill happened during a time of war, clean-up actions were delayed. Efforts were made to protect a few delicate areas. If action could have been taken earlier, less oil would have gotten into the water. Booms and skimmers were set up and used to protect some areas. People from all over the world went to the area to help with the cleanup. The worst spill in U.S. history occurred in March 1989 when the supertanker, Exxon Valdez, ran



aground in Prince William Sound, Alaska. About 11 million gallons (260,000 barrels) of oil spilled from the tanker. It spread out to 900 miles of shoreline. This shoreline and neighboring islands are home to deer, bears, seals, otters, whales, birds and fish, and other plants and animals.

Oil Spill Laws:

Many governments have laws regulating oil spills. In the United States, spills of oil and other chemicals must be reported to the National Response Center at 1-800-424-8802 so action can be taken to contain the spill and clean it up to reduce pollution. Many states and local governments have similar laws.

Determination of Oil and Grease in Water

PerkinElmer Spectrum series FTIR spectrometer makes the analysis simple and easy.

The methods to comply with global and Indian regulations.

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