

## Solar energy

Solar energy is the energy obtained from the sun through the process of photovoltaic conversion or solar thermal conversion.

In photovoltaic conversion, light energy from the sun is absorbed by photovoltaic cells made of semiconducting materials, such as silicon, which causes electrons in the material to become excited and release their energy as electric current. This is known as the photovoltaic effect.

In solar thermal conversion, the sun's radiation is captured and used to heat a fluid, such as water or air, which is then used to generate electricity through a steam turbine.

Both of these processes rely on the principles of quantum mechanics, specifically the absorption and emission of photons, as well as the transfer of energy through electrical circuits.

In summary, solar energy is a clean and renewable source of energy that utilizes the principles of quantum mechanics to convert the sun's radiation into useful forms of energy for humanity.

## Climate change

Climate change refers to the long-term change in the average temperature and weather patterns on Earth that have come about as a result of human activities.

In terms of chemistry, climate change is primarily driven by the increase of greenhouse gases in the atmosphere, such as carbon dioxide ( $\text{CO}_2$ ) and methane ( $\text{CH}_4$ ), which trap heat from the sun and warm the planet.

These gases are released into the atmosphere through the burning of fossil fuels such as coal, oil, and gas, as well as deforestation and other land-use changes. These emissions cause the concentrations of greenhouse gases in the atmosphere to increase, which enhances the greenhouse effect and leads to global warming.

The burning of fossil fuels also results in the release of other pollutants such as sulfur dioxide ( $\text{SO}_2$ ) and nitrogen oxides ( $\text{NO}_x$ ) which can contribute to the formation of acid rain and the destruction of the ozone layer.

The overall effect of these changes is a warming of the Earth's surface and atmosphere, leading to a range of impacts such as melting ice caps, rising sea levels, and more frequent extreme weather events.

In summary, climate change is a result of human activities that increase the levels of greenhouse gases in the atmosphere, leading to global warming and a range of impacts on the planet's climate and ecosystems.

## Polythene degradation

Polyethylene (PE) degradation is a chemical process in which the polymer chains of PE break down due to the influence of environmental factors such as heat, UV radiation, and oxidative agents.

At the molecular level, the degradation of PE results in chain scission and crosslinking, causing a loss of mechanical strength and an increase in brittleness. This can be due to:

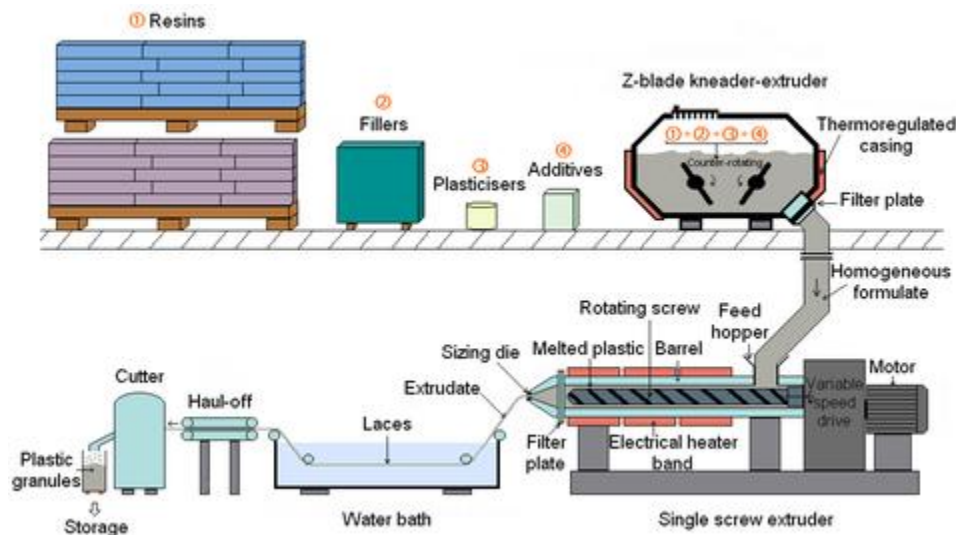


Fig: Polymer degradation

1. Thermal oxidation: PE is susceptible to thermal oxidation, especially at high temperatures. This reaction leads to the formation of carbonyl and carboxyl functional groups, causing the polymer to degrade and crosslink.

2. Photooxidation: PE is also vulnerable to photooxidation when exposed to UV radiation. This causes the formation of free radicals, which can further initiate oxidation reactions that break down the polymer chains.
3. Environmental stress cracking (ESC): ESC is a phenomenon in which PE cracks under mechanical stress in the presence of specific chemicals such as solvents, fuels, and acids. The cracking is due to the degradation of the polymer chains near the surface, resulting in a loss of mechanical properties.

Overall, PE degradation can lead to a reduction in the material's physical and chemical properties, making it unsuitable for its intended application. To mitigate this, PE can be formulated with stabilizing additives or processed in a controlled environment to minimize exposure to environmental factors that cause degradation.

## Fire extinguish

Fire extinguishment can be described as the process of reducing or eliminating the heat, oxygen, and fuel source necessary for combustion in order to put out a fire.

In chemical terms, fire is a reaction between fuel and an oxidizer, such as oxygen, which releases heat and light (the flames). To extinguish a fire, one or more of the components of the fire triangle must be removed.

1. Cooling: removing heat from the fire by cooling the fuel and reducing its temperature below its ignition point. This can be done through the use of a fire blanket, or water-based extinguisher.
2. Starvation: removing the oxygen source from the fire by sealing off the air supply. This can be achieved through the use of a fireproof barrier or smothering the fire with a fire blanket.
3. Suppression: reducing the reaction rate by interfering with the chemical reaction that is producing the fire. This can be done through the use of a

fire extinguisher that contains a fire suppressant such as a foam, powder or gas.

In summary, fire extinguishment is a process of removing or reducing the components of the fire triangle to prevent or stop combustion, resulting in putting out the fire.