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Solar-OxyTree System

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Abstract - *This paper introduces an innovative solar technology inspired by the way trees convert sunlight into energy. The concept, known as the artificial oxygen Tree, is designed to benefit humanity and support environmental sustainability. This system combines several functions: it performs electrolysis on sewage water to produce hydrogen (for fuel) and oxygen (to release into the air), while simultaneously generating electricity using photovoltaic (PV) panels installed at the top of the structure. The model is intended to be installed above sewage tanks, where the electrolysis process takes place. Electrolysis involves connecting an electrical power source to two electrodes submerged in water, allowing an electric current to flow. This causes hydrogen to form at the cathode and oxygen at the anode. The hydrogen is then collected and stored in a tank for use as fuel, while the oxygen is released into the atmosphere to improve air quality. The PV panels on the tree's top capture sunlight and convert it into electricity. These panels are made of semiconductor materials, typically crystalline silicon, which absorb solar energy. The electricity generated is stored and used to power LEDs on the tree, enabling it to function as a streetlight. This multifunctional design integrates renewable energy generation with environmental restoration.*

***Key Words*: *Solar Tree, Solar Panels, Electrolysis, Street Light,* Oxygen ,etc**

1.INTRODUCTION

Trees naturally play a vital role in converting carbon dioxide into oxygen, an essential process for maintaining the planet's balance. However, due to human greed, forests are being replaced with concrete jungles as trees are cut down to make way for urbanization and profit-driven ventures. This has led to a growing scarcity of clean air. As the population continues to rise, the number of trees dwindles, with deforestation persisting at an alarming rate. Carbon dioxide, which is harmful to humans, is effectively processed by trees to produce the oxygen we rely on to survive. The continued destruction of forests could result in severe consequences, including intensified global warming, acid rain, respiratory illnesses, and other environmental crises. In response to this urgent issue, science and technology have introduced a revolutionary solution: the Artificial Oxygen Tree, designed to mimic the life-sustaining functions of natural trees.

1.1 LITERATURE REVIEW

Research laboratories worldwide are striving to develop innovative and environmentally friendly industrial design solutions. Among these efforts, K. S. Lackner's work focuses on demonstrating and enhancing passive methods to remove carbon dioxide from the atmosphere, addressing the challenges of climate change. This paper introduces the concept of a Solar Tree as an alternative energy source for urban areas. A novel idea involving the use of nanowire solar cells in Solar Tree designs is discussed. Nanowires are known for their exceptional light absorption capabilities, which can be significantly enhanced for improved performance. This makes Solar Trees a groundbreaking urban lighting solution, advancing the development of high-efficiency technologies for sustainable cities.

1.2 ELECTROLYSIS

In the process of electrolysis, an electrical power source is connected to two electrodes immersed in water. Hydrogen gas forms at the cathode (the negatively charged electrode where electrons flow into the water), while oxygen gas is produced at the anode (the positively charged electrode). Under ideal conditions with perfect faradic efficiency, the amount of hydrogen generated is twice the number of moles of oxygen, as their production is proportional to the total electrical charge passing through the solution. However, achieving this requires additional energy, known as overpotential, to overcome activation barriers. The efficiency of the electrolysis process can be improved by adding sulfuric acid, which reduces resistance and enhances the reaction.

2. Solar Panels

A solar panel is a technology that transforms sunlight into electricity through the photovoltaic effect. It is made up of several solar cells, typically crafted from silicon, which generates an electric current when exposed to sunlight. This electricity, initially in the form of direct current (DC), is converted into alternating current (AC) using an inverter, making it suitable for everyday use. Solar panels are built to endure environmental conditions, with a protective glass layer and a sturdy frame ensuring durability and efficiency. They come in various types, such as monocrystalline, polycrystalline, and thin-film, each offering different levels of

efficiency and affordability. Solar panels are extensively used in homes, businesses, and remote areas to provide sustainable, renewable energy, offering an eco-friendly alternative with low maintenance costs.

Table -1: Solar OxyTree System

Product details			
Solar panel	45 watt	Radiations	2
Anode	Positive	oxygen	1
cathode	Negative	hydrogen	1
Electrolysis	H_2O	Potassium hydroxide	60 %
Street Light	35w	White	1

A solar panel is a device that captures sunlight and converts it into electricity using the photovoltaic (PV) effect. The core of a solar panel is made up of multiple solar cells, usually composed of semiconductor materials such as silicon. When sunlight hits these cells, it excites the electrons in the material, generating an electric current. This current is initially in the form of direct current (DC), ,it is converted into alternating current (AC) using an inverter. A solar panel is a device that captures sunlight and converts it into electricity using the photovoltaic (PV) effect. The core of a solar panel is made up of multiple solar cells, usually composed of semiconductor materials such as silicon. When sunlight hits these cells, it excites the electrons in the material, generating an electric current. This current is initially in the form of direct current (DC), but to be usable in homes and businesses, it is converted into alternating current (AC) using an inverter. Solar panels are designed to be durable and weather-resistant, typically protected by a layer of tempered glass that allows sunlight to pass through while shielding the cells from environmental elements.

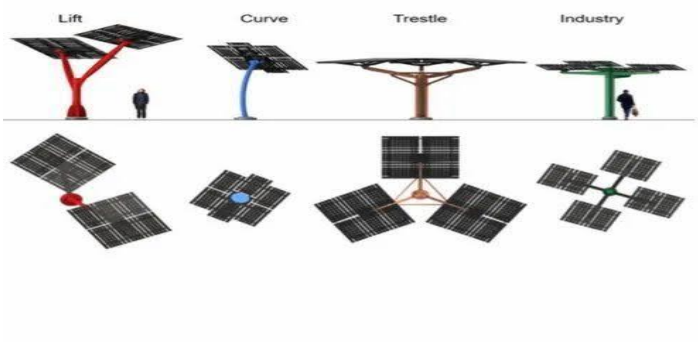

Chart -1: Solar -OxyTree

Solar panels are an integral part of renewable energy systems, offering a clean and sustainable way to generate electricity. They work by harnessing the energy from the sun through photovoltaic cells, which are usually made from silicon. These cells capture sunlight and convert it into electricity through the photovoltaic effect. When sunlight strikes the silicon material, it excites electrons, creating an electric current. This current is then collected and directed into an electrical circuit. However, since the electricity generated by solar panels is in direct current (DC), it must be converted into alternating current (AC) using an inverter, which makes it compatible with standard electrical grids and devices.

Fig -1: Solar-Tree

A solar tree is an innovative structure designed to generate renewable energy using solar panels arranged in a tree-like configuration. These structures mimic the shape of a tree, with a trunk and branches that hold solar panels, often at different angles, to maximize sunlight absorption throughout the day.

3. CONCLUSIONS

We have developed an innovative "artificial tree" that produces oxygen without requiring soil, water, or traditional maintenance, making it an ideal solution for urban environments with limited greenery, high carbon dioxide levels, and low oxygen availability. In addition to oxygen production, the design also functions as a street lighting system, enhancing its utility in cityscapes. The system generates 25 ml of oxygen and 50 ml of hydrogen while producing 2.4 watts of electricity through solar panels. This energy is stored in a 12V rechargeable battery, which powers LEDs for lighting and facilitates electrolysis. Key components include an AVR microcontroller, which processes signals from light-dependent resistors (LDRs) to control the system's operation based on environmental conditions. An oxygen generator measures oxygen output and monitors surrounding temperatures, mimicking the natural role of trees. The system also features an LCD display for providing real-time updates. Environmentally friendly and cost-effective, this artificial tree can be installed in

various locations, requiring minimal maintenance after initial setup. By combining oxygen generation and street lighting, it addresses critical urban challenges while demonstrating efficient use of renewable energy technology.

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