



# Understanding Electrolysis: The Basics

→ Water electrolysis is a process in which water (H<sub>2</sub>O) is split into hydrogen (H<sub>2</sub>) and oxygen (O<sub>2</sub>) gases using electricity. **Here's how it works in simple terms:**

1.



## Electrolysis Setup

Two electrodes (an anode and a cathode) are placed in the water or alkaline electrolyte.

2.



## Applying Voltage

When an electric current is passed through the water via the electrodes, chemical reactions occur.

3.



### At the anode

(positive electrode)  
water molecules lose electrons and are oxidized, producing oxygen gas and hydrogen ions:

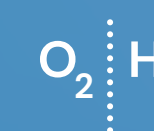


### At the cathode

(negative electrode),  
hydrogen ions gain electrons and are reduced to form hydrogen gas:



4.



## Products

As a result of these reactions, hydrogen gas is collected at the cathode, and oxygen gas is collected at the anode.



# Why Electrolysis is Important: The Big Picture

Water electrolysis is used for producing hydrogen fuel, in chemical production, and in various energy storage systems.



It is a clean way to **generate hydrogen**, which can be used as an energy source or in various industrial processes.





# Electrolysis in Our Daily Lives: Practical Impact

Energy storage using electrolysis and hydrogen is a promising technology that allows for the efficient management of renewable energy sources. During periods of excess energy generation from sources like solar and wind, electrolysis is used to split water into hydrogen and oxygen, storing the hydrogen for later use.

This stored hydrogen can be transported and utilized in fuel cells to produce electricity with water vapor as the only byproduct, making it a clean energy carrier.

Hydrogen also offers long-term storage capabilities, scalability, and the potential to reduce greenhouse gas emissions when produced from renewable sources. **Thus, electrolysis is poised to play a crucial role in creating a sustainable energy future.**



# The Crucial Difference: Why innovation is needed?

Innovation in electrolysis is crucial for enhancing efficiency, reducing costs, and improving scalability to meet the growing demand for hydrogen as a clean energy carrier. Current electrolysis technologies often face limitations in energy efficiency and material costs, making it necessary to develop advanced systems that can produce hydrogen more economically and sustainably.

Additionally, innovations can enhance the durability and lifespan of electrolyzers, enabling them to withstand degradation over time. As renewable energy sources become more prevalent, it's essential to create electrolysis solutions that can quickly respond to fluctuations in energy supply. Overall, advancing electrolysis technology is vital for making hydrogen a key component of the transition to a low-carbon energy future.





# CLEANHYPRO's Role: Addressing Electrolysis Challenges

CLEANHYPRO aims to address electrolysis-related challenges by focusing on innovative solutions that enhance the efficiency, cost-effectiveness, and sustainability of hydrogen production. **The initiative emphasizes the development of advanced materials and electrolyzer designs that improve energy efficiency and reduce operational costs.**

The project promotes research into durable and long-lasting electrolyzer technologies, which can withstand the rigors of operation while minimizing maintenance needs. By fostering collaboration among industry stakeholders, academia, and research institutions, **CLEANHYPRO** contributes to advancing the commercialization of hydrogen technologies and facilitating their adoption in a low-carbon energy landscape.