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## Review

# An overview of cathode material and catalysts suitable for generating hydrogen in microbial electrolysis cell

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### ABSTRACT

Bio-electrohydrogenesis through Microbial Electrolysis Cell (MEC) is one of the promising technologies for generating hydrogen from wastewater through degradation of organic waste by microbes. While microbial activity occurs at anode, hydrogen gas is evolved at the cathode. Identifying a highly efficient and low cost cathode is very important for practical implication of MEC. In this review, we have summarized the efforts of different research groups to develop different types of efficient and low cost cathodes or cathode catalysts for hydrogen generation. Among all the materials used, stainless steel, Ni alloys Pd nano-particle decorated cathode are worth mentioning and have very good efficiency. Industrial application of MEC should consider a balance of availability and efficiency of the cathode material.

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## 1. Introduction

Energy is considered as the lifeline of modern era. Non-renewable energy sources like coal, oil and natural gas are excessively used to meet the world's energy requirements. This has come out with an increased rate of depletion of the natural resources. This is a global concern as the future generations would definitely be at threat if the natural resource is depleted at this alarming rate. There are of course alternatives for non-renewable energies. Utilization of solar energy, wind, tidal, geothermic and bio energy, which in principle are renewable, are possible alternatives.

Bio-electrochemical system (BES) possesses a tremendous potential for energy generation and simultaneous treatment of wastewater containing organic substances. Microbes present in the anode degrade the organic substance and release electron to the solid anode surface which travel

through the external circuit. There are two aspects of this BES. One in which electricity is produced known as MFC and another where hydrogen is produced known as Microbial Electrolysis Cell (MEC) [1]. Cathode is one of the most important parts of the MEC where hydrogen as well as different chemical compounds are produced. In recent time numbers of researches are directed toward development and application of a low cost cathode or cathode catalyst for practical utilization in MECs for hydrogen generation. In this article the material and catalyst used by different research groups for hydrogen generation and result obtained are discussed.

## 2. Hydrogen as fuel

Recently interest on hydrogen as a fuel has increased a lot mainly due to the reason that hydrogen has the highest

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