Hydrogen Generation from Reaction of Waste Aluminum Powder and Water: The High-Temperature Steam Oxidation Method

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Abstract

The reaction between aluminum powder and water can be exploited to produce hydrogen. However, this reaction is inhibited by the aluminum oxide layer that coats the particles. Various activation and conversion methods has been developed to overcome this issue.

The relatively low cost of aluminum and the potential to carry out its reaction with water in an environmentally sustainable manner make it a promising material for hydrogen production. Moreover, the limitations to the diffusion of hydrogen related to its transport and storage could be overcome using aluminum powders to produce on-site hydrogen.

This work presents the state of the art of the most environmentally promising methods for hydrogen generation through oxidation of aluminum powder by steam at high temperature.

The results of preliminary tests of aluminum powder oxidation carried out in high temperature steam at ambient pressure are presented. The production of hydrogen via the reaction between waste aluminum powder and steam was confirmed, as evidenced by the conversion of aluminum to alumina. This observation confirmed the feasibility of this process, validated the existing literature and established the base for future advancements in using aluminum waste powders for hydrogen production.

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