

INVESTIGATING MEMBRANE MATERIALS FOR SUSTAINABLE HYDROGEN PRODUCTION FROM BIOMASS FOR USE IN THE ENERGY SECTOR

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Rezumat. Studiul explorează potențialul materialelor membranare în producția de hidrogen sustenabil din biomasă, concentrându-se pe utilizarea acestuia în sectorul energetic. Prin integrarea tehnologiilor avansate de membrană, se vizează optimizarea proceselor de conversie a biomasei în hidrogen, fără emisii de CO₂. Analiza se concentrează pe caracteristicile de selectivitate și permeabilitate ale diferitelor membrane, evaluând eficiența și sustenabilitatea procesului. Utilizarea hidrogenului rezultat în sectorul energetic poate contribui la reducerea dependenței de sursele de energie fosile și la promovarea unei economii mai curate și mai durabile.

Abstract. The study explores the potential of membrane materials in sustainable hydrogen production from biomass, focusing on their utilization in the energy sector. Integrating advanced membrane technologies aims to optimize biomass conversion processes into hydrogen without CO₂ emissions. The analysis focuses on the selectivity and permeability characteristics of different membranes, evaluating the efficiency and sustainability of the process. Using resulting hydrogen in the energy sector can reduce dependence on fossil energy sources and promote a cleaner, more sustainable economy.

Keywords: Hydrogen; Membrane; BECCS; Biomass; CO₂ capture

1. Introduction

Hydrogen has a significant potential as an energy vector in transitioning to a low-carbon, renewable energy economy. The main reasons why hydrogen is seen as a viable option in this respect include its energy storage capacity, its versatility in use (from fuel cell vehicles to energy storage and electricity generation), and the fact that it can be produced from renewable sources such as wind, solar or biomass. In addition, hydrogen has a high potential to reduce carbon dioxide emissions in the sectors where it is used, helping to combat climate change.

Developing efficient hydrogen separation technologies is essential to facilitate its use as an energy source. Currently, the most common method of hydrogen

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