

## Author's Accepted Manuscript

A Protonic Ceramic Membrane Reactor for the Production of Hydrogen from Coal Steam Gasification

V. Kyriakou, I. Garagounis, A. Vourros, G.E. Marnellos, M. Stoukides



PII: S0376-7388(17)33164-2  
DOI: <https://doi.org/10.1016/j.memsci.2018.02.047>  
Reference: MEMSCI15972

To appear in: *Journal of Membrane Science*

Received date: 5 November 2017  
Revised date: 29 January 2018  
Accepted date: 20 February 2018

Cite this article as: V. Kyriakou, I. Garagounis, A. Vourros, G.E. Marnellos and M. Stoukides, A Protonic Ceramic Membrane Reactor for the Production of Hydrogen from Coal Steam Gasification, *Journal of Membrane Science*, <https://doi.org/10.1016/j.memsci.2018.02.047>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# A Protonic Ceramic Membrane Reactor for the Production of Hydrogen from Coal Steam Gasification

V. Kyriakou<sup>1,2\*</sup>, I. Garagounis<sup>1,2</sup>, A. Vourros<sup>1,2</sup>, G.E. Marnellos<sup>2,3,4</sup>, M. Stoukides<sup>1,2</sup>

<sup>1</sup> Department of Chemical Engineering, Aristotle University, Thessaloniki, Greece

<sup>2</sup> Chemical Process & Energy Resources Institute, CERTH, Thessaloniki, Greece

<sup>3</sup> Department of Mechanical Engineering, University of Western Macedonia, Kozani, Greece

<sup>4</sup> Department of Environmental Engineering, University of Western Macedonia, GR-50100 Kozani, Greece

\*Corresponding author. Tel.: +30-2310-996145. kyriakou@cperi.certh.gr

## Abstract

In the present work, the feasibility of producing and simultaneously separating hydrogen from coal steam gasification (CSG) in a protonic ceramic membrane reactor (PCMR) is demonstrated. A Cu/BZCY81/Ni-BZCY72 tubular cell was employed as the PCMR for the studies. Saturated steam was fed over a mixture of powdered carbon black and  $K_2CO_3$  gasification catalyst, which was in contact with the Cu anode. At 600 to 700 °C, the electrochemical separation of generated  $H_2$  from the gasification chamber (anode) was found to enhance the reaction rate to  $H_2$  and  $CO_2$  by up to 60%. This novel approach to the steam gasification of carbon holds promise for the production of high purity  $H_2$  from coal- or biomass-based electrochemical processes at much lower operation temperatures, compared to the conventional thermochemical methods.

## Graphical Abstract

Download English Version:

<https://daneshyari.com/en/article/7020007>

Download Persian Version:

<https://daneshyari.com/article/7020007>

[Daneshyari.com](https://daneshyari.com)