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# THERMAL SCIENCE

## International Scientific Journal

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### GAS POLLUTANT CLEANING BY A MEMBRANE REACTOR

#### ABSTRACT

An alternative technology for the removal of gas pollutants at the intergrated gasification combined cycle process for power generation is the use of a catalytic membrane reactor. In the present study, ammonia decomposition in a catalytic reactor, with a simultaneous removal of hydrogen through a ceramic membrane, was investigated. A Ni/Al<sub>2</sub>O<sub>3</sub> catalyst was prepared by the dry and wet impregnation method and characterized by ICP, SEM, XRD and N<sub>2</sub> adsorption before and after activation. Commercially available  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> membranes were also characterized and the permeabilities and permselectivities of H<sub>2</sub>, N<sub>2</sub> and CO<sub>2</sub> were measured by the variable volume method. In parallel with the experimental analysis, the necessary mathematical models were developed to describe the operation of the catalytic membrane reactor and to compare its performance with the conventional reactor.

#### KEYWORDS

ammonia decomposition, nickel/alumina catalyst, ceramic membrane, hydrogen separation

PAPER SUBMITTED: 2005-10-07

PAPER REVISED: 2006-02-06

PAPER ACCEPTED: 2006-03-14

CITATION EXPORT: [view in browser](#) or [download as text file](#)

THERMAL SCIENCE YEAR 2006, VOLUME 10, ISSUE 3, PAGES [143 - 149]

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