Development of Ceramic Membrane for Oxygen Gas Separation

Yosuke Takahashi [a)], Yuji Hirano [a)], Akihiro Kawahara [a)],
Hisatomi Taguchi [a)], Masayoshi Hirano[b)]

[a)]*Research & Development Center, Development & Engineering Group, Noritake Co.,Limited*
300,Higashiyama,Miyoshi,Aichi,470-0293,Japan
Tel: 81(561) 34-6215, Fax: 86(561)34-4997
E-mail: yosuke-takahashi@n.noritake.co.jp
http://www.noritake.co.jp/company/rd/

[b)] *Environmental Technology Group, Energy Applications R&D Center,*
CHUBU Electric Power Co.,Inc
20-1,Kitasekiyama,Ohdaka-cho,Midoriku,Nagoya,459-8522, Japan

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Introduction

Ceramic dense membranes based on mixed-ion and electronic conductors have been attracted attention as a new method for oxygen gas separation. These membranes can be applied for the partial oxidation of methane to synthesis gas, in which ceramic membrane acts as an oxidation transfer and reactor. It is well known that some perovskite-type oxides such as LaSrCoFeOx[1)], BaSrCoFeOx[2)], LaSrGaFeOx[3)] show high electronic and ionic conductivity, and high oxide permeation. However, these materials are comparatively expensive because of the presence of rare metals, and also unstable in reduction atmosphere. For industrial application, the above problems should be solved and also the oxygen permeation rate should be improved.

In this work, we developed a new mixed conductive material based on LaSrTiFeOx, having high oxygen permeation rate and high stability. The developed LaSrTiFeOx membrane showed high oxygen conductivity and extremely high stability in reduction and steam atmosphere, further, the production of such membrane is cost effective.

The membranes were fabricated by making a dense coating of LaSrTiFeOx on the LaSrTiFeOx ceramic porous support. In order to have maximum oxygen permeation rate, the thickness of the membrane coating was made as thin as possible(50～70um). At this stage, we could attain an oxygen permeation rate of 27 cc/min/cm^2. The fabrication process was scaled up and membranes having a length more than 1m were successfully developed.

References

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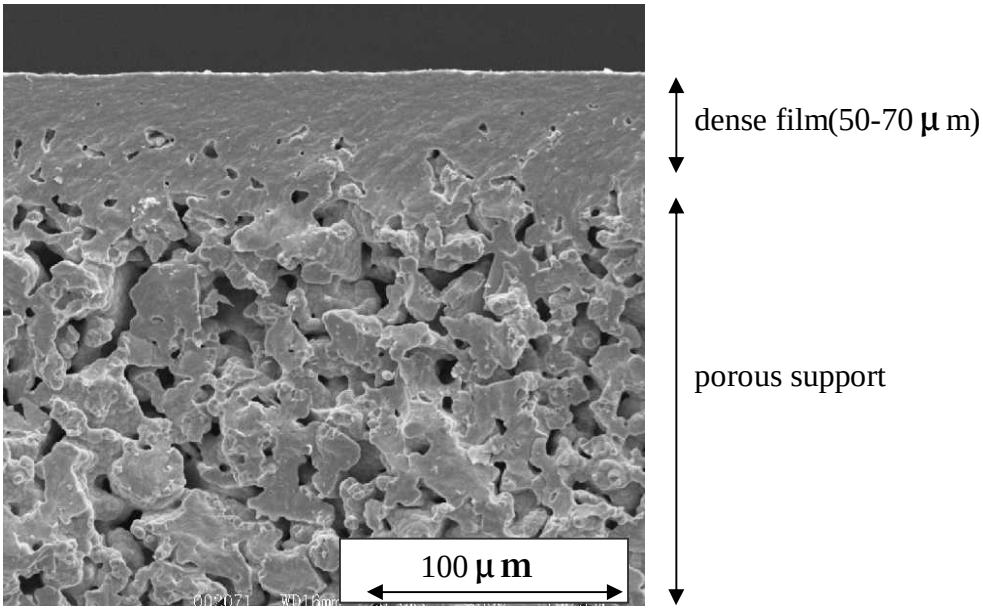

Fig1. Cross section of LaSrTiFeOx membrane

Fig2. Scale upped cylindrical membrane

About Myself

Name: Yosuke Takahashi
Nationality: Japanese
Affiliation: Research & Development Center, Development & Engineering Group, Noritake Co.,Limite
E-mail: yosuke-takahashi@n.noritake.co.jp
Research Area: Inorganic Material Chemistry, Inorganic Membrane, Gas Separation
Hobby: Golf, Badminton, Movie
Favorite Movie: Nights with the Midnight Sun, Forrest Gump,