

HOW TO MANEUVER IONIC TRANSPORT IN CERAMICS FOR PETROLEUM ALTERNATIVE ENERGY GENERATION.

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THE STUDY OUTLINE

To maneuver the transportation's ions or molecules (such as proton oxygen ions, H₂ gas *etc.*) in the ceramics is a new significant technique to perform a petroleum alternative energy producing and supplying system by using H₂ gas and fuel cells. With the point of view, this project intends to develop the following new ceramics to easily maneuver the ionic transport for producing and supplying H₂ gas, based on young scientist's idea and motivation.

We have obtained an effective way to make the permeating temperature of the oxygen permeable ceramics lower, by investigating the relation between oxygen permeation and crystal structure for the mixed conductive layered perovskite.

We have investigated relation between porosity and mechanical/thermal shock resistance properties of the porous alumina substrate to find out an appropriate substrate condition for H₂ gas permeating membrane.

ACADEMIC PAPERS (total 6papers)

1. "Influence of Layered Perovskite Structure on Oxygen Permeability of Sr-La-Fe-Co oxide",
I. Kagomiya, M. Suzumura, K. Kakimoto and H. Ohsato,
J. Phys. Soc. Jpn. 79, Suppl. A 109-112 (2010).
2. "Oxygen Permeation and Microstructure of Intergrowth Perovskite Sr-La-Fe-Co Based Mixed-conductive Ceramics",
I. Kagomiya, M. Suzumura, K. Kakimoto and H. Ohsato,
J. Ceram. Soc. Jpn. 117, 996-998 (2009).
3. "Estimation of Thermal Shock Resistance of Fine Porous Alumina by Infrared Radiation Heating Method"
S. Honda, Y. Ogihara, S. Hashimoto, Y. Iwamoto,
J. Ceram. Soc. Japan, 117, 1208-1215 (2009).
4. "Strength and Thermal Shock Properties of Scandia-Doped Zirconia for Thin Electrolyte Sheet of Solid Oxide Fuel Cell",
S. Honda, K. Kimata, S. Hashimoto, Y. Iwamoto, M. Yokoyama, J. Shimano, K. Ukai, and Y. Mizutani,
Mater. Trans., 50, 1742-1746 (2009).
5. "Synthesis and characterization of proton conducting Inorganic-Organic hybrid nanocomposite membranes based on Tetraethoxysilane/ Trimethylphosphate/ 3-glycidoxy propyltrimethoxy silane/ Heteropoly Acids",
G. Lakshminarayana and M. Nogami,
Electrochimica Acta 54, 4731-4740 (2009).
6. "Synthesis and Characterization of Proton Conducting Inorganic-Organic Hybrid Nanocomposite Membranes Based on mixed PWA- PMA- TEOS- GPTMS- H₃PO₄-APTES for H₂/O₂ Fuel Cells",
G. Lakshminarayana and M. Nogami,
Journal of Physical Chemistry C 113, 14540-14550 (2009).

CONFERENCE PRESENTATION (total 13 presentations)

1. "Oxygen Permeability and Electrical Properties of Sr_{3-x}LaxFeCoO_{7-δ} Ceramics",
I. Kagomiya, M. Suzumura, K. Kakimoto and H. Ohsato,
Electronic Materials and Applications 2011, Oland (2011/1/19-21).
2. "Oxygen permeation properties of layered perovskite Sr_{3-x}LaxFeCoO_{7-δ} ceramic membrane",
I. Kagomiya, M. Suzumura, K. Jinbo, K. Kakimoto,
4th International Workshop on Advanced Ceramics(IWAC04) Nagoya (2010/12/10-12).
3. "Oxygen Permeability and Electrical Properties of Layered Perovskite Sr_{3-x}LaxFeCoO_{7-d} Ceramics",
I. Kagomiya, M. Suzumura, K. Kakimoto and H. Ohsato,
ICC3, 大阪 (2010/11/14-18).
4. "層状ペロブスカイト Sr_{3-x}LaxFeCoO_{7-d} の酸素透過特性",
籠宮功, 鈴村雅矢, 柿本健一, 大里齊,
固体イオニクス討論会, 仙台 (2010/11/24-26).
5. "Mixed Conductive Properties of Oxygen Permeable Sr_{3-x}LaxFeCoO_{7-d} Ceramic Membrane",
I. Kagomiya, M. Suzumura, K. Kakimoto and H. Ohsato,
ElectroceramicsXII, Trondheim, Norway (2010/6/13-16).
6. "インターグロース型ペロブスカイト Sr_{3-x}LaxFeCoO_{7-d} の導電特性",
籠宮功, 鈴村雅矢, 柿本健一, 大里齊,
セラミックス協会 2010 年年会, 東京農工大学 (2010/3/22-24).
7. "Influence of Layered Perovskite Structure on Oxygen Permeability of Sr-La-Fe-Co Oxides",
I. Kagomiya, M. Suzumura, K. Kakimoto and H. Ohsato,
ICPSSI-3, 熊本 (2009/10/25-28)
8. "Properties and Thermal Shock Resistance of Fine Porous Alumina for Support Substrates of Ceramic Membranes",
S. Honda, S. Takaaki, N. Nishihara, S. Hashimoto, T. Eda, H. Watanabe, K. Miyajima, and Y. Iwamoto,
35th International Conference & Exposition on Advanced Ceramics & Composites (ICACC'11), Daytona Beach, USA (2011/1/23-29) (ICACC-S9-025-2011)
9. "Properties and Thermal Shock Resistance of Fine Porous Alumina for Support Substrates of Ceramic Membranes",
S. Honda, T. Senda, N. Nishihara, S. Hashimoto, T. Eda, H. Watanabe, K. Miyajima and Y. Iwamoto,
4th International Workshop on Advanced Ceramics(IWAC04) Nagoya (2010/12/10-12).
10. "SC-O-03 Properties and Thermal Shock Resistance of Fine Porous Alumina for Support Substrates of Ceramic Membranes",
S. Honda, T. Senda, N. Nishihara, S. Hashimoto, T. Eda, H. Watanabe, K. Miyajima and Y. Iwamoto,
The 27th International Korea-Japan Seminar on Ceramics Incheon, Korea (2010/11/23-26).
11. "Estimation of Properties and Thermal Shock Resistance of Fine Porous Alumina",
S. Honda, T. Senda, N. Nishihara, H. Watanabe, K. Miyajima, S. Hashimoto and Y. Iwamoto,
3rd International Congress on Ceramics(ICC3) Osaka (2010/11/14-18).
12. "分離膜支持基材用アルミナ多孔体の耐熱衝撃特性"
本多沢雄, 荻原有騎, 橋本 忍, 岩本雄二,
日本セラ協 2010 年年会, 東京 (2010/3/22-24).
13. "Thermal shock properties of porous alumina for support carries of hydrogen membrane materials",
S. Honda, Y. Ogihara, S. Hashimoto and Y. Iwamoto,
34th International Conference & Exposition on Advanced Ceramics & Composites (34th ICACC), Daytona Beach (2010/1/24-29).