

Abstract

Project Code: RMU4880017

Project Title: Multifunctional Reactors for Chemical and Petrochemical Industries

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This project was aimed to develop new basic knowledge related to multifunctional reactors for chemical and petrochemical industries. The works were focused on 3 sub-research topics including 1) Study on fuel cells, 2) Study on reaction and extraction system and 3) Study on periodic operation. From the works, 15 international papers have been accepted for publication and 3 international papers are under consideration. In addition, 5 papers were presented in international conferences. The followings summarize the lists of all outputs.

International Papers

- 1) W. Jamsak, S. Assabumrungrat, P.L. Douglas, N. Laosiripojana and S. Charojrochkul, "Theoretical Performance Analysis of Ethanol-Fueled Solid Oxide Fuel Cells with Different Electrolytes", Chemical Engineering Journal 119 (2006) 11–18. (IF-2006 = 1.594).
- 2) S. Assabumrungrat, N. Laosiripojana and P. Philunrekekun, "Determination of Boundary of Carbon Formation for Dry Reforming of Methane in Solid Oxide Fuel Cell", Journal of Power Sources, vol. 159 (2006) 1274-1282 (IF-2006 = 3.521).
- 3) Eakkapon Promaros, Suttichai Assabumrungrat, Navadol Laosiripojana, Piyasan Prasertdam, Tomohiko Tagawa and Shigeo Goto, "Carbon dioxide reforming of methane under periodic operation", Korean Journal of Chemical Engineering 24 (2007) 44-50 (IF-2006 = 0.808).
- 4) Garun tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, "Fe (III), Cu (II), V (V)/TiO₂ for hydroxylation

- of benzene to phenol with hydrogen peroxide at room temperature”, Journal of Chemical Engineering of Japan, vol. 40 (2007) 415-421 (IF-2006 = 0.594).
- 5) Garun Tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, “Liquid phase hydroxylation of benzene to phenol with hydrogen peroxide catalyzed by Fe (III)/TiO₂ catalysts at room temperature”, Journal of Industrial & Engineering Chemistry, vol. 13 (2007) 444-451 (IF-2006 = 0.957).
 - 6) S. Vivanpatarakij, S. Assabumrungrat and N. Laosiripojana, “Improvement of SOFC performance by using non-uniform cell potential operation”, Journal of Power Sources, vol. 167 (2007) 139-144 (IF-2006 = 3.521).
 - 7) W. Jamsak, S. Assabumrungrat, P.L. Douglas, N. Laosiripojana, R. Suwanwarangkul, S. Charojrochkul and E. Croiset “Performance Assessment of Bioethanol-Fed Solid Oxide Fuel Cell System Integrated with a Distillation Column”, ECS Transactions - Solid Oxide Fuel Cells vol. 7 (2007) 1475-1482 (IF-2006 = -).
 - 8) W. Jamsak, S. Assabumrungrat, P.L. Douglas, N. Laosiripojana, R. Suwanwarangkul, S. Charojrochkul and E. Croiset “Performance of Ethanol-Fueled Solid Oxide Fuel Cells: Proton and Oxygen Ion Conductors”, Chemical Engineering Journal, vol. 133/1-3 (2007) 187-194 (IF-2006 = 1.594).
 - 9) Garun Tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, “Multi transition metal catalysts supported on TiO₂ for hydroxylation of benzene to phenol with hydrogen peroxide”, Journal of Industrial & Engineering Chemistry, vol. 13 (2007) 870-877 (IF-2006 = 0.957).
 - 10) W. Jamsak, S. Assabumrungrat, P.L. Douglas, E. Croiset, N. Laosiripojana, R. Suwanwarangkul and S. Charojrochkul, “Thermodynamic Assessment of Solid Oxide Fuel Cell System Integrated with Bioethanol Purification Unit”, Journal of Power Sources, vol. 174 (2007) 191-198 (IF-2006 = 3.521).
 - 11) W. Sangtongkitcharoen, S.Vivanpatarakij, N. Laosiripojana, A. Arpornwichanop and S. Assabumrungrat, “Performance analysis of methanol-fueled solid oxide fuel cell system incorporated with palladium membrane reactor”, Chemical Engineering Journal, vol. 138 (2008) 436-441 (IF-2006 = 1.594).
 - 12) Garun tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, “Hydroxylation of benzene to phenol on Fe/TiO₂

catalysts loaded with different types of second metal”, Catalysis Communications, Vol. 9 (2008) 1886-1890 (IF-2006 = 1.878).

- 13) Hiroshi YAMADA, Tomoaki MIZUNO, Tomohiko TAGAWA, Garun TANARUNGSUN, Piyasan PRASERTHDAM and Suttichai ASSABUMRUNGRAT "Catalyst Regenerator for Partial Oxidation of Benzene in Reaction-Extraction System" Journal of the Japan Petroleum Institute, vol. 51 (2008), 114-117. (IF-2006 = 0.633)
- 14) P. Philunrekekun, S. Assabumrungrat, N. Laosiripojana and A.A. Adesina, "Selection of appropriate fuel processor for biogas-fuelled SOFC system", Chemical Engineering Journal, in press (IF-2006 = 1.594).
- 15) Garun Tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, "Ternary metal oxide catalysts for selective oxidation of benzene to phenol", accepted by Journal of Industrial & Engineering Chemistry, April 9, 2008 (IF-2005 = 0.957).

Submitted International Papers (under consideration)

- 1) S. Vivanpatarakij, S. Assabumrungrat, and N. Laosiripojana, "Performance improvement of solid oxide fuel cell system using palladium membrane reactor with different operation modes", submitted to Chemical Engineering Journal, December 2007 (IF-2006 = 1.594).
- 2) Boonrat Pholjaroen, Navadol Laosiripojana, Piyasan Prasertdam and Suttichai Assabumrungrat, "Reactivity of Ni/SiO₂.MgO toward carbon dioxide reforming of methane under steady state and periodic operations" submitted to Fuel Processing Technology, April 11, 2008 (IF-2006 = 1.323).
- 3) P. Philunrekekun, S. Assabumrungrat, N. Laosiripojana and A.A. Adesina, "Performance of biogas-fed solid oxide fuel cell systems integrated with membrane module for CO₂ removal", submitted to Chemical Engineering and Processing: Process Intensification, April 2, 2008 (IF-2006 = 1.129).

International Conferences

- 1) Eakkapon Promaros, Suttichai Assabumrungrat, Navadol Laosiripojana, Piyasan Prasertdam, Tomohiko Tagawa and Shigeo Goto, "Carbon dioxide reforming of methane under periodic operation", Fifth international conference on unsteady-state processes in catalysis, Suita City, Japan Nov. 22-25, 2006 (poster presentation).

- 2) Boonrat Pholjaroen, Eakkapon Promaros, Navadol Laosiripojana, Suttichai Assabumrungrat, Piyasan Prasertthdam, Tomohiko Tagawa and Shigeo Goto “Characterization of deposited coke on Ni/SiO₂.MgO catalyst from carbon dioxide reforming of methane under periodic operation”, Singapore, December 3-5, 2006 (oral presentation).
- 3) W. Sangtongkitcharoen, S. Assabumrungrat, N. Laosiripojana, A. Arpornwichanop, S.Vivanpatarakij and P. Prasertthdam “Performance analysis of methanol-fueled solid oxide fuel cell system Incorporated with palladium membrane reactor”, The sixth International Symposium on Catalysis in Multiphase Reactors (CAMURE-6) and the fifth International Symposium on Multifunctional Reactors (ISMR-5), January 14-16, 2007 (poster presentation).
- 4) S. Vivanpatarakij, S. Assabumrungrat, N. Laosiripojana and P. Prasertthdam, “Improvement of SOFC performance by using non-uniform cell potential operation”, The sixth International Symposium on Catalysis in Multiphase Reactors (CAMURE-6) and the fifth International Symposium on Multifunctional Reactors (ISMR-5), January 14-16, 2007 (oral presentation).
- 5) W. Jamsak, S. Assabumrungrat, P.L. Douglas, N. Laosiripojana, R. Suwanwarangkul, S. Charojrochkul and E. Croiset “Performance Assessment of Bioethanol-Fed Solid Oxide Fuel Cell System Integrated with a Distillation Column”, 10th International Symposium on Solid Oxide Fuel Cells (SOFC-X), Nara, Japan, June 3-8, 2007 (oral presentation).

บทคัดย่อ

รหัสโครงการ: RMU4880017
ชื่อโครงการ: เครื่องปฏิกรณ์แบบหลายหน้าที่สำหรับอุตสาหกรรมเคมีและปิโตรเคมี
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โครงการวิจัยนี้มีวัตถุประสงค์เพื่อสร้างองค์ความรู้พื้นฐานที่เกี่ยวข้องกับเครื่องปฏิกรณ์แบบหลายหน้าที่สำหรับอุตสาหกรรมเคมีและปิโตรเคมี งานที่ศึกษาสามารถแบ่งออกเป็น 3 หัวข้อย่อย คือ 1) การศึกษาทางด้านเซลล์เชื้อเพลิง 2) การศึกษาระบบการเกิดปฏิกิริยาที่มีการสกัด และ 3) การศึกษาการดำเนินงานแบบสลับ ผลงานที่ได้จากการศึกษานี้คือ บทความที่น่าสนใจในวารสารระดับนานาชาติที่ได้รับการยอมรับให้ตีพิมพ์แล้ว 15 บทความ และบทความที่น่าสนใจในวารสารระดับนานาชาติที่อยู่ระหว่างการพิจารณา 3 บทความ นอกจากนี้ยังมีการนำเสนอผลงานในที่ประชุมระดับนานาชาติอีก 5 บทความ โดยรายละเอียดสรุปได้ดังต่อไปนี้

บทความวิจัยระดับนานาชาติที่ได้รับการยอมรับให้ตีพิมพ์แล้ว

- 1) W. Jamsak, S. Assabumrungrat, P.L. Douglas, N. Laosiripojana and S. Charojrochkul, "Theoretical Performance Analysis of Ethanol-Fueled Solid Oxide Fuel Cells with Different Electrolytes", Chemical Engineering Journal 119 (2006) 11–18. (IF-2006 = 1.594).
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- 3) Eakkapon Promaros, Suttichai Assabumrungrat, Navadol Laosiripojana, Piyasan Prasertdam, Tomohiko Tagawa and Shigeo Goto, "Carbon dioxide reforming of methane under periodic operation", Korean Journal of Chemical Engineering 24 (2007) 44-50 (IF-2006 = 0.808).
- 4) Garun Tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, "Fe (III), Cu (II), V (V)/TiO₂ for hydroxylation of benzene to phenol with hydrogen peroxide at room temperature", Journal of Chemical Engineering of Japan, vol. 40 (2007) 415-421 (IF-2006 = 0.594).
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- phenol with hydrogen peroxide catalyzed by Fe (III)/TiO₂ catalysts at room temperature”, Journal of Industrial & Engineering Chemistry, vol. 13 (2007) 444-451 (IF-2006 = 0.957).
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 - 8) W. Jamsak, S. Assabumrungrat, P.L. Douglas, N. Laosiripojana, R. Suwanwarangkul, S. Charojrochkul and E. Croiset “Performance of Ethanol-Fueled Solid Oxide Fuel Cells: Proton and Oxygen Ion Conductors”, Chemical Engineering Journal, vol. 133/1-3 (2007) 187-194 (IF-2006 = 1.594).
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 - 10) W. Jamsak, S. Assabumrungrat, P.L. Douglas, E. Croiset, N. Laosiripojana, R. Suwanwarangkul and S. Charojrochkul, “Thermodynamic Assessment of Solid Oxide Fuel Cell System Integrated with Bioethanol Purification Unit”, Journal of Power Sources, vol. 174 (2007) 191-198 (IF-2006 = 3.521).
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 - 12) Garun Tanarungsun, Worapon Kiatkittipong, Suttichai Assabumrungrat, Hiroshi Yamada, Tomohiko Tagawa and Piyasan Prasertdam, “Hydroxylation of benzene to phenol on Fe/TiO₂ catalysts loaded with different types of second metal”, Catalysis Communications, Vol. 9 (2008) 1886-1890 (IF-2006 = 1.878).
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- 14) P. Philunrekekun, S. Assabumrungrat, N. Laosiripojana and A.A. Adesina, “Selection of appropriate fuel processor for biogas-fuelled SOFC system”, Chemical Engineering Journal, in press (IF-2006 = 1.594).
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บทความวิจัยระดับนานาชาติที่อยู่ระหว่างการพิจารณา

- 1) S. Vivanpatarakij, S. Assabumrungrat, and N. Laosiripojana, “Performance improvement of solid oxide fuel cell system using palladium membrane reactor with different operation modes”, submitted to Chemical Engineering Journal, December 2007 (IF-2006 = 1.594).
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การนำเสนอผลงานในที่ประชุมระดับนานาชาติ

- 1) Eakkapon Promaros, Suttichai Assabumrungrat, Navadol Laosiripojana, Piyasan Prasertdam, Tomohiko Tagawa and Shigeo Goto, “Carbon dioxide reforming of methane under periodic operation”, Fifth international conference on unsteady-state processes in catalysis, Suita City, Japan Nov. 22-25, 2006 (poster presentation).
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