Nobuyuki GOKON, Dr. Eng.

Associate Professor
Program: Advanced Materials Science and Technology
Area: Applied Chemistry and Chemical Engineering
Center for Transdisciplinary Research,
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Professional Expertise

My professional expertise is high-temperature solar chemistry for converting solar heat to chemical fuels: solar thermochemical water splitting cycles, solar reforming of natural gas and solar gasification of coal. Especially, his interests are in developments of highly-active solar working material/catalyst and solar reactor/receiver/absorber/reformer.

Research Fields of Interest

Solar thermochemical two-step water-splitting for producing hydrogen from water

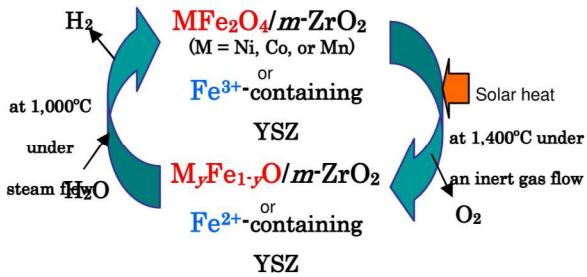
- Reactivity of highly active reacting particles
- Reaction mechanism of reactive material for thermochemical two-step water splitting
- Development of ceramic foam device as a solar receiver/absorber
- Solar demonstration of the foam device in a solar facility
- Solar reactor design using Internally-circulating fluidized bed
- Kinetics of hydrogen production

Solar methane reforming for solar-hybrid synthetic gas production

- Reactor tube design
- Development of high-temperature thermal storage medium of molten-salt/MgO composite
- Solar facility test of the reactor

Solar coal gasification for solar-hybrid synthetic gas production

- Solar reactor design
- Kinetics of synthetic gas production
- Solar radiation tests of the reactor in solar facility



Concept of Solar Thermochemical Two-Step Water Splitting for Hydrogen Production from Water

Education

2000: Dr.Eng. in Interdisciplinary Graduate School of Science and Engineering,
Tokyo Institute of Technology, Japan
1997: M.E. in Interdisciplinary Graduate School of Science and Engineering,
Tokyo Institute of Technology, Japan
1995: B.E. in Department of Material Science, Ibaraki University, Japan

Professional Societies and Activities

Executive Committee Member, Journal of the Japan Institute of Energy.

Awards

1. The 6th Intelligent Cosmos Prize of Intelligent Cosmos Foundation, 2007
2. Doctoral Thesis Prize of Tejima Foundation Awards, 2001

Major Publications

Papers

[1] "Ni/MgO-Al_2O_3 and Ni-Mg-O catalyzed SiC foam absorbers for high temperature solar reforming of methane", *International Journal of Hydrogen Energy*, vol. 35, no. 14, pp. 7441-7453, 2010.

[2] "Coal Coke gasification in a windowed solar chemical reactor for beam-down optics", *ASME Journal of Solar Energy Engineering*, vol. 132, no. 4, pp. 041004-1-6, 2010.

[3] "Comparative study of the activity of nickel ferrites for solar hydrogen production by two-step thermochemical cycles", *International Journal of Hydrogen Energy*, vol. 35, no. 16, pp. 8503-8510, 2010.

[4] "Two-Step Thermochemical Cycles for High-Temperature Solar Hydrogen Production", *Advances in Science and Technology*, vol. 72, pp. 119-128, 2010.

[5] "Kinetics of methane reforming over Ru/γ-Al_2O_3 catalyzed metallic foam at 650-900ºC for solar receiver-absorbers", *International Journal of Hydrogen Energy*, vol. 36, no. 1, pp. 203-215, 2011.

[6] Ferrite/Zirconia coated foam device prepared by spin coating for a solar demonstration of thermochemical water-splitting" , *International Journal of Hydrogen Energy*, vol. 36, no. 3, pp2014-2028, 2011.

[7] "Thermochemical two-step water splitting by internally circulating fluidized bed of $NiFe_2O_4$ particles: Successive reaction of thermal-reduction and water-decomposition steps" , *International Journal of Hydrogen Energy*, vol. 36, no. 8, pp. 4757-4767, 2011.

[8] "高温太陽集熱によるソーラー水素製造技術",日本エネルギー学会誌, in press.

[9] "Internally circulating fluidized bed reactor for water-splitting thermochemical cycle with *m*-ZrO_2 supported $NiFe_2O_4$ particles", *ASME Journal of Solar Energy Engineering*, vol. 132, no. 2 pp. 021102-1-10, 2010.

[10]"高温太陽熱を利用したソーラー水素の製造", 太陽エネルギー, vol. 35, no. 5, pp. 3-14, 2009.

[11] "Double-walled reformer tubes with molten salt thermal storage for solar cavity-type reformer tubes", *International Journal of Hydrogen Energy*, vol. 34, no.17, pp7143-7154, 2009.

[12] "Monoclinic Zirconia supported Fe_3O_4 for two-step water-splitting thermochemical cycle at thermal reduction temperatures of 1400-1600 ºC", *International Journal of Hydrogen Energy*, vol. 34, pp. 1208-1217, 2009.

[13] "Kinetics of CO_2 reforming of methane by catalytically activated metallic foam absorber for solar receiver-reactors" *International Journal of Hydrogen Energy*, vol. 34, no. 4, pp. 1787-1800, 2009.

[14] "New solar water-splitting reactor with ferrite particles in an internally circulating fluidized bed", *ASME Journal of Solar Energy Engineering*, vol. 131, pp. 011007-1-011007-9, 2009.

[15] "Molten-Salt Tubular Absorber/Reformer (MoSTAR) Project: the thermal storage media of Na_2CO_3-MgO composite materials" *ASME Journal of Solar Energy Engineering*, vol. 131, no. 4, pp. 041013-1-8, 2009.

[16] "Reactive Fe-YSZ coated foam devices for solar two-step water splitting", *ASME Journal of Solar Energy Engineering*, vol. 131, no. 2, pp. 021008-1-7, 2009.

[17] "A new solar chemical reactor with an internally circulating fluidized bed for direct irradiation of reacting particles" *ASME Journal of Solar Energy Engineering*, vol. 130, no. 1, pp. 014504-1-4, 2008.

[18] "Thermochemical two-step water splitting by ZrO_2-supported $Ni_xFe_{3-x}O_4$ for solar hydrogen production", *Solar Energy*, vol. 82, no. 1, pp. 73-79, 2008.

[19] "Iron-containing YSZ (Yttrium-Stabilized Zirconia) system for a two-step thermochemical water splitting", *ASME Journal of Solar Energy Engineering*, vol. 130, no. 1, pp. 011018-1-011018-6, 2008.

[20] "Thermochemical two-step water splitting for hydrogen production using Fe-YSZ particles and a ceramic foam device", *Energy*, vol. 33, no. 9, pp. 1407-1416, 2008.

[21] "High-Temperature Carbonate/MgO Composite Materials as Thermal Storage Media for Double-Walled Solar Reformer Tubes", *Solar Energy*, vol. 82, no. 12, pp. 1145-1153, 2008.

[22] "Thermochemical cycles for high temperature solar hydrogen production", *Chemical Reviews*, vol. 107, pp. 4048-4077, 2007.

[23] "Double-Walled Reactor Tube with Molten Salt Thermal Storage for Solar Tubular Reformers", *Journal of Solar Energy Engineering*, vol. 128, no. 2, pp. 134-138, 2006.

[24] "Ru/Ni-Mg-O Catalyzed SiC-Foam Absorber for Solar Reforming Receiver-Reactor" *Journal of Solar Energy Engineering*, vol. 128, no. 3, pp. 318-325, 2006.

[25] "Decomposition of Zn-ferrite for O_2-generation by concentrated solar radiation" *Solar Energy*, vol. 76, pp.317-322, 2004.

[26] "Photocatalytic effect of ZnO on carbon gasification with CO_2 for high temperature solar thermochemistry" *Solar Energy Materials & Solar Cells*, vol. 80, pp. 335-341, 2003.