

# AIChE-Pittsburgh November Meeting Notice

Thursday, November 17, 2011

Joint meeting with ACS-Energy Technology Group (ACS-ETG) and ASM

## Nanostructuring Oxygen Carriers for Chemical Looping Combustion

**Götz Vesper, Chemical Engineering Department, Swanson School of Engineering, University of Pittsburgh and U.S. Department of Energy, National Energy Technology Laboratory**

Chemical looping combustion (CLC) is an emerging technology for clean energy-production from fossil and renewable fuels. In CLC, an oxygen carrier (typically a metal) is first oxidized with air. The hot metal oxide is then transferred to a second reactor, where it is reduced in contact with a fuel. Finally, the reduced metal is transferred back to the oxidizer, closing the materials "loop." CLC is considered a 'green' combustion technology since it allows for flame-less and low-NO<sub>x</sub> combustion without requiring expensive air separation. Furthermore, CLC produces sequestration-ready CO<sub>2</sub> streams without significant energy penalty. Combined with sequestration, CLC thus enables high-efficiency, CO<sub>2</sub> emissions-free combustion of fossil fuels, and combustion processes with negative CO<sub>2</sub>-footprint when biomass-derived fuels are used.

Among the main issues in industrial realization of CLC is the insufficient stability of existing oxygen carriers, and their relatively slow metal re-oxidation kinetics. Following an introduction to CLC technology, I present a brief overview of our recent work on the development of robust nanocomposite oxygen carriers for CLC. I will demonstrate that appropriate nanostructuring of materials can result in exceptionally active and robust carrier materials, even at the demanding high-temperature conditions of CLC. Using these nanomaterials, I will furthermore demonstrate that the CLC principle can be extended beyond pure combustion processes onto hydrogen production, CO<sub>2</sub> activation, and integrated desulfurization. Chemical Looping can thus be considered a platform technology with broad potential for the development of highly intensified energy-related processes.

**Götz Vesper, Ph.D.**, obtained a Diploma in chemical engineering at the University of Karlsruhe in 1990, and a Ph.D. in physical chemistry at the Fritz Haber Institute, Berlin (Germany) in 1993, with G. Ertl and R. Imbihl. He was Feodor-Lynen Postdoctoral Fellow with L. D. Schmidt at the University of Minnesota (1994-96), research associate at the University of Stuttgart (1996-99), and research group leader at the Max-Planck-Institute for Coal Research (Mülheim an der Ruhr, 2000-02). In 2002, he joined the University of Pittsburgh where he is now professor of chemical engineering and CNG faculty fellow. Dr. Vesper's research interests are in catalytic reaction engineering, in particular the design of functional nanomaterials, microchemical reactors, and multifunctional reactor concepts with application to energy technology. Among his most recent honors and awards are the Career Award of the National Science Foundation (2005), the R.A. Glenn Award of the Fuel Chemistry Division of the American Chemical Society (2007), a plenary keynote at the 6th World Congress on Oxidation Catalysis (Lille, France; 2009), and a visiting professorship at Dalian University of Technology (China; 2009). Dr.



Veser currently also serves on the board of the North American Catalysis Society, and is a faculty fellow at the U.S. Department of Energy's National Energy Technology Laboratory (Pittsburgh, PA). He can be reached at gveser@pitt.edu or +1 (412) 624 1042.

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***Location: Spaghetti Warehouse, 26th & Smallman Streets, Strip District, Pittsburgh PA  
Free parking behind the restaurant. Thursday, November 17, 2011, Social Hour 6:00 pm, Dinner 6:30 pm, Talk 7:30 pm.***

***For reservations, please contact Frank Sommerfield, Vice-Chair, AIChE-Pittsburgh Section, by Wednesday, November 16, 2011 at 412-809-6553 or by E-mail at [fsommerfield@chesterengineers.com](mailto:fsommerfield@chesterengineers.com). Our meetings are open to all.***

The cost of the dinner is \$16 including tax and gratuity. Please specify your preference: spaghetti with meatballs, 15-layer lasagna, four-cheese manicotti, fettuccini alfredo, or grilled chicken Caesar salad. Also, please indicate special needs such as vegetarian, gluten-free, etc.