University of Connecticut

United Technologies

UTC Institute for Advanced Systems Engineering Seminar Series

George M. Bollas
Department of Chemical & Biomolecular Engineering
University of Connecticut

MODEL-DERIVED CHEMICAL-LOOPING SYSTEM DESIGNS

Friday, April 4, 2014 4:00 – 5:00 p.m.   Storrs Campus, UTEB 150

Abstract**:** Commercialization and broad application of chemical-looping systems face several roadblocks, among which the reactor size, separation steps, and cost and environmental impact of the material lost during the process are most significant. Recently, a novel reactor concept was invented that allows consideration of chemical-looping as a reverse-flow fixed-bed process, overcoming these difficulties. The performance of the new system was evaluated at bench-scale and its industrial scale-up equivalent, using a process model. This analysis showed that periodic reversal of the gas flow during chemical-looping reduction leads to significant improvements in in CO_2 selectivity, CO_2 capture efficiency, and bed temperature fluctuations. Transformative contributions of this research include exploration, and optimization of a novel system for scalable CO_2 capture. The simplicity in the principle of operation of these systems could lead to a breakthrough in CO_2 capture research, capable of allowing CO_2 sequestration realization within shorter timeframes than currently considered. This work puts chemical-looping research and technology on a fundamentally new learning curve; one that relaxes the requirement for fluidized-bed reactor systems and is capable of making chemical-looping a disruptive new technology.

Speaker Bio: Dr. George Bollas is an Assistant Professor with the Department of Chemical & Biomolecular Engineering at the University of Connecticut, a process design expert and winner of the prestigious NSF CAREER Award and the ACS PRF DNI Award. He received B.E. and Ph.D. degrees from the Aristotle University of Thessaloniki in Greece and then worked as a postdoctoral research associate at the Chemical Engineering Department of MIT. Dr. Bollas is the director of the Process Design Simulation and Optimization Laboratory (PDSOL), which performs research on system intensification and processes that address the growing energy crisis and the environmental impact of energy production. His current research portfolio includes model-based and experimental analyses of processes for chemical-looping combustion with an emphasis on the scale-up of existing pilot plants to power plant capacities; experimental and theoretical studies of biomass pyrolysis, gasification, and catalyst deactivation during biomass catalytic processing; Fischer-Tropsch Synthesis; and model-based design of aircraft cabin air and temperature control.