The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar

Professor Jeongmin Ahn

Ph.D. Candidate
School of Mechanical and Materials Engineering
Washington State University, Pullman, WA

Lecture Title: Spiral Counterflow Heat-Recirculating Combustors And Applications To Power Generation Utilizing A Solid-Oxide Fuel Cells

Friday, April 23, 2010, 10:00 AM, Room 173 Light Engineering

Abstract

An experimental study of the performance of a Swiss-roll type heat exchanger/combustor was conducted, with emphasis on the extinction limits and comparison of results with and without catalyst. Experiments results have shown reducing wall thermal conductivity and thickness leads to lower heat losses and therefore extends flammability limits. A polymer combustor was built and survived prolonged testing at temperatures up to 500 ºC and may prove more practical for microscale devices due to their lower thermal conductivity and ease of manufacturing. Since the ultimate goal of those efforts is to develop combustion driven power generation devices, a thermally self-sustaining miniature power generation device was developed utilizing a single-chamber solid-oxide-fuel-cell (SOFC) placed in a Swiss roll. With the single-chamber design, fuel/oxygen crossover due to cracking of seals via thermal cycling is irrelevant and coking on the anode is practically prohibited. SOFC power densities up to 420 mW/cm^2 were observed at low Re. These results suggest that single-chamber SOFC's integrated with heat-recirculating reactors may be a viable approach for microscale power generation devices.

Biography

Prof. Jeongmin Ahn is an Assistant Professor in the School of Mechanical and Materials Engineering at the Washington State University (WSU) in Pullman, WA. Prof. Ahn received a B.S. degree in Mechanical Engineering from the Rensselaer Polytechnic Institute, a M.S. degree in Aerospace Engineering from the University of Michigan, Ann Arbor, and a Ph.D. degree in Aerospace Engineering from the University of Southern California. Prof. Ahn has extensive research experience in combustion, power generation, propulsion and thermal management. He performed an experimental investigation of catalytic and non-catalytic combustion in heat recirculating combustors, solid-oxide fuel cells, micro heat engines, thermoacoustic engines, and thermal transpiration based propulsion and power generation. He has worked on a DARPA project to develop an integrated microscale power generator based on a solid-oxide fuel cell employing hydrocarbon fuels. Currently, his research is conducted in the Combustion and Energy Research Laboratory (COMER) at WSU.

Directions: Please call Augusta Kuhn at 631-632-8310 for more information.

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