

**STEVENS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

Wednesday, September 24, 2008

[note new time] Carnegie Room 315, Time 10am [note new time]

Photo Structurable Glass Ceramics Enabled Micro-Fluidic Thruster Systems for Pico/Nano-Satellites

Professor Po-Hao Adam Huang

Mechanical Engineering Department, University of Arkansas

The maturation of Micro-Electro-Mechanical Systems (MEMS) has enabled scientists and engineers to leverage this technology toward greater understanding of their domains. One prominent example is the development of lab-on-a-chip systems for biological and chemical sciences. Due to the integrated and miniaturized nature of such a system, it is often associated with the ability to provide chemical and biological analysis with smaller working volumes, faster, cheaper, and more accurately. Such an ideal MEMS platform can be extended to miniaturized space-craft design that leverages on the near identical MEMS technology developed for lab-on-a-chip systems, the development of pico- and nano-satellites (defined as 1kg and 10kg class vehicle weight, respectively). The usage of large arrays of these spacecraft will match and/or exceed the capabilities of existing expensive, bulky, and heavy satellites. An integrated approach to fabricate these spacecraft with photostructurable glass ceramics as primary structural layer allows them to be mass-produced cheaply and rapidly. A terrestrial test prototype that satisfies the inspector class missions (so called Co-Orbital Satellite Assistant, COSA) will be presented here. The micro structured 325 gram COSA prototype includes a cold gas micro fluidic thruster system for 2D maneuvering (with HFC 236fa propellant), onboard processing network, RF transceivers, and MEMS rate gyro and magnetometer.

Dr. Po-Hao Adam Huang received his B.S., M.S., and Ph.D. degrees in Aerospace Engineering from the University of California, Los Angeles (UCLA) in 1998, 2003, and 2006, respectively; under the mentorship of Dr. Chih-Ming Ho at UCLA. He is currently an assistant professor at the University of Arkansas and a Member of Technical Staff at The Aerospace Corporation since 2000. At UCLA, Mr. Huang has worked on the flight control of delta wing aircraft using MEMS sensors and actuators, surface shear streak reduction with MEMS sensors and actuators in a turbulent wind tunnel, and the microfabrication and testing of nano-particle polymer composites. With the Aerospace Corporation, he is currently working on the usage of photo structurable glass/ceramics as multifunctional materials for pico/nano-satellites. He has demonstrated a working terrestrial prototype of an inspector pico-satellite with onboard cold gas micro-fluidics, MEMS rate-gyro, processors, and RF transceivers. His research interests are in multi-scale (from nano to macro) hardware technologies for aerospace and robotic applications.

For more information, please contact Prof. EH Yang at Eui-Hyeok.Yang@stevens.edu or 201-216-5574