



Interdisciplinary Study on Experimental Fluid Dynamics and Chemistry: Luminescent Imaging and Chemical Flow Control for Fluid Dynamic Problems

**Tuesday,
March 25, 2014,
3:30P.M.**

**Lower Level
Auditorium,
Geddes Hall**

**Refreshments served
at 3:00 p.m. in the
Geddes Hall
Coffee House**

An interdisciplinary study on experimental fluid mechanics and chemistry is presented. Two columns of research topics are introduced: luminescent imaging and chemical flow control. The former uses a nano-structured sensor. Representative ones are known as pressure- and temperature-sensitive paints (PSP/TSP). Based on the sensor and system developments, the luminescent imaging has been applied to experimental unsteady flows. The advantages of using luminescent imaging are the size of a luminescent probe and a non-intrusive technique. The probe is a molecule, and the size of which is on the order of sub-nano meters. The probe is excited by a light source so that we can locate the target as a point/area/volume in a flow. The luminescent imaging techniques are developed to discover and to solve fluid dynamic problems as a thermo-fluid system. One of the main contributions to experimental aerodynamics is a time-resolved unsteady surface pressure measurement. This will be a breakthrough in understanding complicated unsteady flow phenomena. Some of the fluid dynamic measurements in transonic, supersonic, hypersonic, and two-phase flows by the luminescent imaging will be presented in the seminar.

Representative ones of the chemical flow control use hydrophobic and hydrophilic coatings. These are nano- and micro-structured coatings that repel water (hydrophobic) or attract water (hydrophilic). This can be applied to various flow-control topics. A chemical coating can be sprayed or coated to a target object to provide a control surface. Currently, this has been applied to anti-/de-icing of aircrafts. Because the icing can be seen everywhere in cold climate, which is not only a problem in aeronautics, the coating can be applied to various environmental and industrial problems, for example an application to wind turbine. Recent progresses in the chemical flow control will be presented in the seminar.

By the cross linkage of the luminescent imaging and chemical flow control, Dr. Sakaue's interdisciplinary studies have covered a broad spectrum of research initiatives including fluid dynamics, flow control, green energy/environmental engineering, and biomedical engineering. With these four signature fields, Dr. Sakaue has more concentrated on fluid dynamics and flow control. The seminar will be illustrated with a demonstration. At the end of the seminar, an outlook for the future research plans will be proposed.



Dr. Hiroataka Sakaue
Institute of Aeronautical
Technology, Japan
Aerospace Exploration
Agency (JAXA)
Tokyo, Japan

*If you are interested in
meeting individually with
Dr. Sakaue, please
contact Linda at
631-5431.*