**LHD 学术报告会&青年学术系列论坛(2012 年 5 月 10 日周四 9 点-12 点)**

（一）

报告题目：

# 基于低温等离子体发射光谱强度比的中性粒子诊断研究

演讲人：

**李 江 （力学所）**

时间：2012 年 5 月 10 日（周四）上午 9:00-10:00

地点：力学所 1 号楼 312 会议室

邀请人：黄河激 副研

报告摘要：

基于低温等离子体的干法刻蚀技术在半导体设备制造相关领域发挥了不可替代的作用，是目前实现各向异性刻蚀和选择性刻蚀的商业上唯一可行的技术。气体放电中产生的各种中性粒子是影响低温等离子体刻蚀以及其它应用的重要因素，因此对这些粒子的诊断以及相关动力学机制既是科学研究和工业应用关心的重要内容，也是难点内容。尽管一些传统的诊断方法，如激光吸收谱、吸收光谱、质谱等常被应用于诊断中性粒子密度，但是这些方法都比较复杂，不适于工业应用所要求的在线诊断。另一方面，发射光谱技术是一种非常简单的诊断手段，容易实现在线诊断，在低温等离子体参数诊断中发挥了巨大作用。但是，

目前发射光谱较难应用于定量诊断中性粒子密度及其空间分布。通过对发射光谱自吸收特性的研究，我们发现一些中性粒子的密度与它们的某些光谱的逃逸因子有较强的函数关系，因此可以从这些逃逸因子中得到粒子密度的信息。在此基础上，本文提出了一种利用发射光谱强度比的方法来诊断中性粒子密度及空间分布的方法。在以 CF4 和 Ar 为原料气体的射频容性耦合等离子体中，运用谱线强度比方法，诊断了氩原子 1s 能级组、碳原子、铝原子的密度以及轴向空间分布，这些诊断结果分别与理论计算、紫外宽带吸收谱、激光吸收谱得到的结果符合很好，证明了谱线强度比方法的可靠性。通过与这些方法的对比，得出谱线强度比方法具有如下优点：实验系统简单；不需要额外光源；可测量粒子种类较多；容易实现空间分辨诊断；更容易实现在线诊断。

（二）

报告题目：

# Applications of Plasma Actuators in Delta-Winged UAVs and MAVs

演讲人：


## Professor Chih-Yung Wen
## ( AIAA Associate Fellow Department of Aeronautics and Astronautics National Cheng-Kung University, Taiwan)


时间：2012 年 5 月 10 日（周四）上午 10:00-12:00

地点：力学所 1 号楼 312 会议室

邀请人：姜宗林 研究员

报告摘要：

**This talk presents the preliminary fundamental research on applying plasma actuators on the delta wings. Plasma actuators that discharge at one atmosphere have attracted considerable attention in the aerospace industry, especially in the applications of UAV and MAV, due to their features of simple mechanism, easy maintenance, low cost and fast response ( 1 ns, theoretically). Their working principles are to apply a positive voltage and a negative voltage on the surface of an aerial vehicle by two electrodes, which then ionize the adjacent gas molecules and form the plasma. The electric field induces the motion of the plasma and results in the ionic wind consequently. The ionic wind alters the velocity profile inside the boundary layer through the particle collisions and may change the aerodynamic characteristics of the vehicle, for example, delay of flow separation, increase of lift…etc. Plasma actuators can be categorized as either corona discharge or dielectric barrier discharge (DBD) by their mechanism.**

**This ongoing research applies both types of plasma actuators on delta wing models and investigates their effects on the aerodynamics of the delta wing models at different Reynolds numbers and angles of attack. The experiments are conducted in a water tunnel and a low speed wind tunnel. In the water tunnel experiments, the locations of vortex breakdown at different angles of attack are identified first by dye visualization. In the wind tunnel experiments, the characteristics of the ionic wind induced by both plasma actuators are calibrated by a glass pitot tube. The smoke wire technique is adopted to observe the leading edge vortices and a force balance is also used to measure the aerodynamic characteristics of the delta wing. The lift and rolling moment coefficients with and without plasma actuators functioning are compared. Results show that the delta wing models with plasma actuators operating have better performance on the lift and rolling moment coefficients, especially at low Reynolds number and high angle of attack. The present results demonstrate that it is promising to apply the plasma actuators in delta-winged UAVs and MAVs.**

**Recent experimental results on self-ignition of a pre-heated H2 traverse jet in a supersonic free-stream will be also presented, including movie clips of (1) Schlieren images taken by the high speed camera and (2) OH chemiluminescence image captured by an intensified CDD.**

报告人简介：

**Professor Chih-Yung Wen is currently full professor in the Department of Aeronautics and Astronautics, National Cheng-Kung, Taiwan. Dr. Wen received the BSc degree at Department of Mechanical Engineering, National Taiwan University in 1986 and MSc. and Ph.D degrees at the Department of Aeronautics, Caltech in 1989 and 1994, respectively. Dr. Wen worked at Caltech as a research fellow from Feb., 1994 to Jul. 1994, right after he finished his Ph.D degree. He then continued his teaching and research works at Department of Mechanical Engineering, Da-Yeh University, Taiwan. During his 12-year professor career at Da-Yeh University, he has been elected as the Chairman of the department (Aug. 1997~Jul. 2000), promoted to full professor in Feb., 2002, and appointed as the Dean of Academic Affairs (Aug. 2004~Jul. 2006). In Aug. 2006, Dr. Wen joined Department of Aeronautics and Astronautics, National Cheng Kung University (NCKU). Dr Wen has authored and co-authored over 60 scientific papers, mostly published in international refereed journals. He has more than 40 international conference papers, including six invited papers and lectures. He also contributed 2 book chapters and was awarded 9 patents. His current research interests are in the areas of (1) Aerodynamic Applications of Plasma Actuators in Delta-Winged UAVs and MAVs, (2) Hypersonic Aerodynamics and Scramjet Engine Design, (3) Fuel Cell Applications in the Electric Power System of a Micro Spacecraft, (4) Flow Instabilities of Magnetic Fluids and Their Applications in Micro-mixers. He has received many awards, including Excellent Research Award of National Science Council, Taiwan in 1995, 2000-2010, NCKU Annual (2009) Excellent Industrial Cooperation Award in 2010, Excellent Teaching Award of Department of Aeronautics and Astronautics, NCKU in 2010, Best Paper Award of 51th Annual Conference of Aeronautic and Astronautic Society of Republic of China (AASRC) in 2009, Yearly Best**

**Paper Award of Journal of Mechanics (SCI) in 2001 and 2010, and Best Poster Award, The 12th International Conference on Magnetic Fluids (ICMF12), Aug. 1-5, 2010, Sendai, Japan.**