

The Schedule of This Workshop

Date: 16th September, 2014

Venue: Meeting room 1, Suzukake Hall, Suzukake-dai campus,
Tokyo Institute of Technology

13:00-13:55: Recent developments in structural adhesive joints
Prof. Lucas da Silva, University of Porto

13:55-14:50: Surface engineering and advanced coatings used in
automotive applications
Dr. Gary Critchlow, Loughborough University

14:50-15:10: Coffee break

15:10-17:00: Composites and adhesive bonding; vibration damping,
impact, and an automotive application
Prof. Robert D. Adams, Universities of Oxford and Bristol

17:00-19:00: Welcome party (@ Lounge, Suzukake Hall)

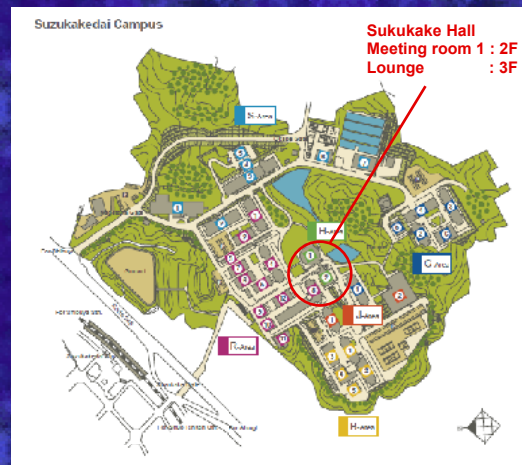
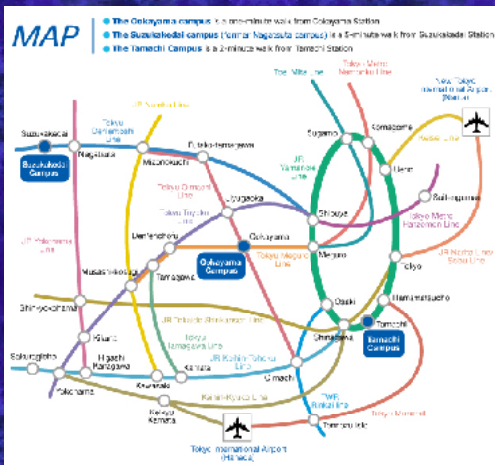
Registration

Sending e-mail to csato@pi.titech.ac.jp by 2nd September, 2014
with your name and affiliation.

This workshop including welcome party is free of charge.

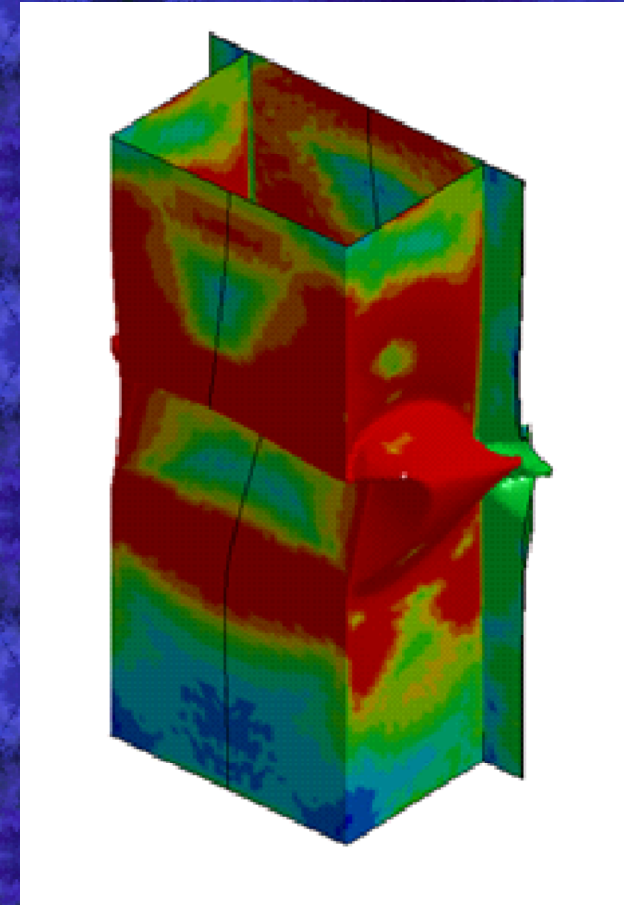
Access

http://www.titech.ac.jp/english/about/campus_maps/suzukakedai.html



The 66th P&I Lab. Symposium

International Workshop on Adhesive Bonding for Car Structures



On 16th September, 2014

At Suzukake-dai campus,
Tokyo Institute of Technology

Scope of This Workshop

The use of adhesively bonded joints has recently been expanding in many fields, especially, automotive applications because the performance of modern adhesives has been improved in strength, heat resistance and durability. Adhesion related technologies such as surface treatments, stress analyses and joint design have also been progressing as well as adhesives. In addition, car structures are going to become multi materials, including steel, aluminium and composites, which can be joined mainly by adhesion. The future of adhesion for automotive manufacturing, therefore, is very bright.

On the other hands, structural adhesion for automotive is not popular in Japan thus far, and the application has just started recently. In other words, we are only following the route established by European engineers even today.

For this workshop, European experts on adhesion, Prof. Adams, Dr. Critchlow and Prof. da Silva are kindly going to give their lectures on the recent progresses on adhesion, especially for automotive applications. It is my great pleasure for us to take the first step to discuss on the topics, exchange the information, know each other and collaborate together.

Chiaki Sato, The organizer of this workshop
P&I lab., Tokyo Institute of Technology



Recent developments in structural adhesive joints

*Prof. Lucas da Silva
Faculty of Engineering
University of Porto, Portugal*

The most recent developments in adhesive joints carried out at the Faculty of Engineering of the University of Porto. Four different topics are discussed: adhesives modified with cork particles, mixed mode fracture toughness, dual adhesives in aerospace structures, graded joints and durability of adhesive joints.

Impact and tensile tests have shown that with the right amount and size of cork particles, it is possible to achieve that goal.

A new multi-mode apparatus, inspired in a load jig previously developed by Fernlund and Spelt is proposed. The jig allows for easy alteration of the mode-mixity and permits covering the full range of mixed-mode I+II combinations.

A test procedure to simulate experimentally the thermal and mechanical load of aluminium-ceramic joints was developed. The tests confirm that a mixed adhesive joint gives an improved mechanical behaviour in comparison with a joint with a silicone adhesive alone.

The aspect of durability is being studied under different perspectives. One project is dedicated to the use thermally expandable particles to heal or self-heal adhesives. Another project is developing a numerical tool, more specifically a cohesive zone element, that takes into account the water absorption of the adhesive, the testing temperature and the loading condition (static or fatigue).



Surface engineering and advanced coatings used in automotive applications

*Dr. Gary Critchlow
Department of Materials
Loughborough University, UK*

Dr Critchlow will discuss elements of surface engineering and advanced coatings used in the automotive, aerospace, space and advanced manufacturing sectors. A range of case studies will be given detailing material and process development leading to improved multifunctional coatings, corrosion protection schemes and optimised joining methods with an emphasis on improving product lifetimes. The drivers behind much of this work is the attainment of environmentally-friendly or high performance manufacturing in the aforementioned sectors.



Composites and adhesive bonding; vibration damping, impact, and an automotive application

*Prof. Robert D. Adams
Universities of Oxford and Bristol, UK*

In my career, I have covered many aspects of composites and adhesive bonding, but I will concentrate here on three related aspects.

Metals have low intrinsic damping, but composites offer the possibility of high strength and stiffness [from the fibres], and damping from the polymeric matrix. The question to be answered is how much damping can we expect and can we predict this. We developed mathematical methods, using both algebra and finite element analysis, to predict the damping and compared the predictions with experimental results. We also investigated the damping in adhesively bonded joints.

Behaviour under impact loading conditions is an important feature of any vehicle structure. With the crash-worthiness of automobile structures in mind, we looked at the strength and energy absorption of a range of aluminium alloys bonded with different adhesives in a lap shear impact pendulum test. This test uses standard lap shear specimens so comparison can be made with static tests.

Finally, I will show the results of a European joint project [LITEBUS] which aimed to design and construct the superstructure of a coach from pre-made composite panels. The project was focussed on the development of novel technology to manufacture bus/coach bodies, so as to reduce the weight and production costs and to produce a structure which met the EU regulations on safety via the "roll-over" test; it did!