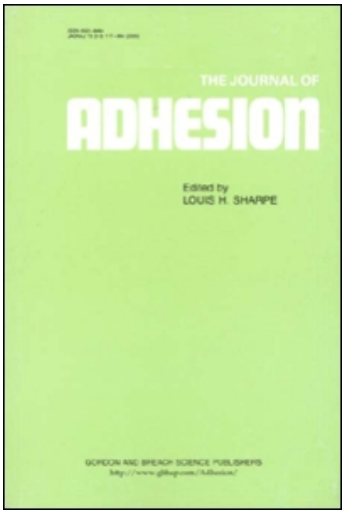

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Guest Editorial

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Guest Editorial

Special Topic Issue on Adhesive Properties, Adhesion and Surface Preparation

This special issue of *The Journal of Adhesion* (JA) contains selected papers presented at the Special Session on "Adhesive Bonding" held at the 2nd International Conference on Advanced Computational Engineering and Experimenting (ACE-X 2008) meeting. ACE-X 2008 was chaired by both of us (AÖ and LFMdS) and held in Barcelona, Spain during 14–15 July, 2008. The goal of the conference was to provide a unique opportunity to exchange information, present the latest results, as well as review the relevant issues on engineering mechanics research today.

The importance of science and technology of adhesion in engineering applications spurred the chairman of the ACE-X 2008 meeting to include a special session dedicated to this subject, organized by one of us (LFMdS) and Professor Juan Carlos Suarez Bermejo. More than 70 papers were presented by researchers from more than 20 countries in the "Adhesive Bonding" Special Session. The organizers wish to thank the authors and delegates for their participation and cooperation, which made this special session possible.

A wide range of topics was covered and many excellent papers were submitted. However, only certain papers were selected for inclusion in this special issue. The special issue is divided into two parts: Part I is about adhesive properties and Part II deals with adhesion and surface preparation. The adhesion science is truly multi-disciplinary in nature and the selection presented here reflects this fact.

Starting with Part I, the paper by Sancaktar and Aussawasathien illustrates the great potential of nanotechnology applied to adhesives. The experimental results show that epoxy nanocomposites containing Electrospun Carbon Nano Fibers (ECNF) with high fiber aspect ratio and high interconnecting network in the non-woven mat form yield better mechanical properties than those filled with short ECNFs.

Adhesives reinforced with naoparticles are also studied in the paper by Prolongo *et al*. Modified epoxy adhesives with carbon nanofibers (CNFs) were tested in composite lap joints. The addition of CNFs slows down the curing reaction of the epoxy adhesive although the final conversion is still high. The contact angle of nanoreinforced adhesives on

the surface of treated laminates is lower than that of the neat epoxy resin. However, this increase of wettability scarcely modified the lap shear strength.

Altaweel *et al.* correlated the mechanical properties of silicone-modified resins in combination with fly ash with free volume parameters measured from Positron Annihilation Lifetime studies. The increase in free volume size in the filled resin indicates poorer polymer-filler interaction but in the silicone-modified, filled resin, the free volume size decreases, which indicates better polymer-filler interactions.

The effect of micro boron carbide (B_4C) particles on the curing and mechanical properties of an epoxy resin was studied by Abenojar *et al*. The major finding is that epoxy-B_4C composites showed excellent bending strength, increasing with B_4C content and with small particles.

Créac'hcadec and Cognard propose a non-associated 2-D model for an adhesive in an assembly, using Arcan type specimens and interface elements. The responses (load-displacement curves) of the proposed model, using few material parameters, are in good agreement with the experimental data in the case of a wide range of deformation rates under different tensile-shear loading tests.

The last paper of Part I by Banea and da Silva presents mechanical properties of a polyurethane and a high temperature silicone rubber. Thick adherend shear tests and single lap joints were tested from low to high temperatures. Decreasing the temperature gave joint strengths comparable with those with structural adhesives. In contrast to joints with brittle adhesives, the failure loads of joints with flexible adhesives increase almost proportionally with increasing overlap length. Fatigue tests were also performed and show a low dispersion of the results.

The first paper of Part II by del Real *et al.* deals with the effect of silane treatment on SiC micro particles used as reinforcement in epoxy resins. The study shows that the silane surface treatment of SiC particles provides a slight modification of their shape which reduces the risk from stress concentrators and micro-crack initiators. In addition, the surface treatment improves the adhesion of the SiC particle to the epoxy resin, increasing bulk strength.

Sancaktar and Ma developed a mathematical procedure to find an approximate analytical solution to the 3-D stress distributions in bonded interfaces of dissimilar materials. The developed procedure provides an efficient tool to optimize interface construction by various surface treatment methods.

Reina *et al.* analyze the influence of the adherend surface roughness on the mechanical performance of single joint laps and, by means of

the application of the "Value Analysis" technique, propose the surface finish that best combines both mechanical performance and suitability to the manufacturing process. It is shown that soft machining by polishing provides high performance with more economical and environmentally friendly surface finishes than rough machining (less waste of material, less costs in tooling and machinery, lower manufacturing times, etc.) and, therefore, enables a better and wider use of adhesives in the industrial manufacturing processes.

Adhesion-related phenomena in electronic components were studied by Lee *et al*. They investigated the feasibility of ultrasonic bonding of a rigid printed circuit board (RPCB) to a flexible printed circuit board (FPCB) with a non-conductive film (NCF) for improving the long-term reliability and lowering the manufacturing cost. The RPCB was successfully bonded to the FPCB with NCF using transverse ultrasonic bonding.

Pinto *et al.* evaluated the tensile strength of single lap joints between similar and dissimilar plastics bonded with an acrylic adhesive. Cohesive failures in the adhesive were obtained with a simple passive surface preparation. The experiments show that increasing the stiffness of the adherends leads to an increase in joint strength. A finite element analysis with a cohesive zone model captured fairly well the experimental behavior of the joints.

The preparation of this special issue has been an interesting experience for the guest editors. The review process gave a deeper insight into the various aspects of adhesive properties, adhesion, and surface preparation and the chance to discuss in detail the manuscripts directly with the authors. We would like to thank the authors for their patience with the process and the reviewers for providing critical evaluations of these manuscripts. Finally, we especially thank Dr. Lou Sharpe, who made this special issue possible.

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