



PhD Brainstorming Day

PhD. Candidate: Alessandro Sitta

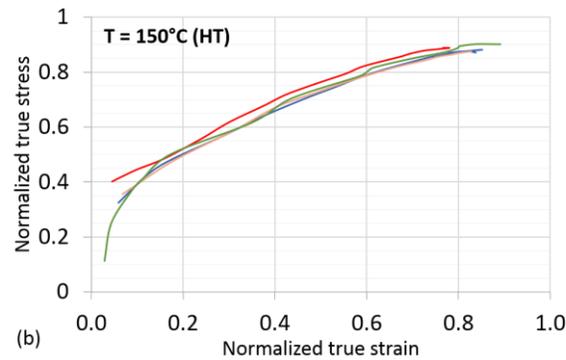
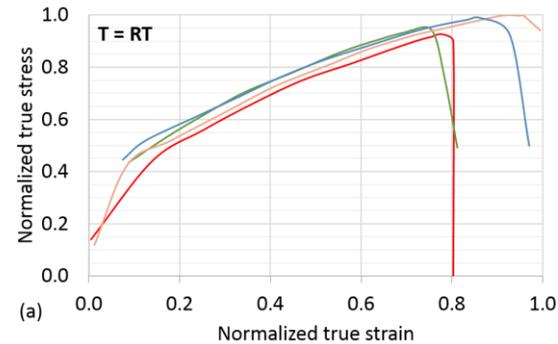
Tutor: Giuseppe Mirone

29/10/2019

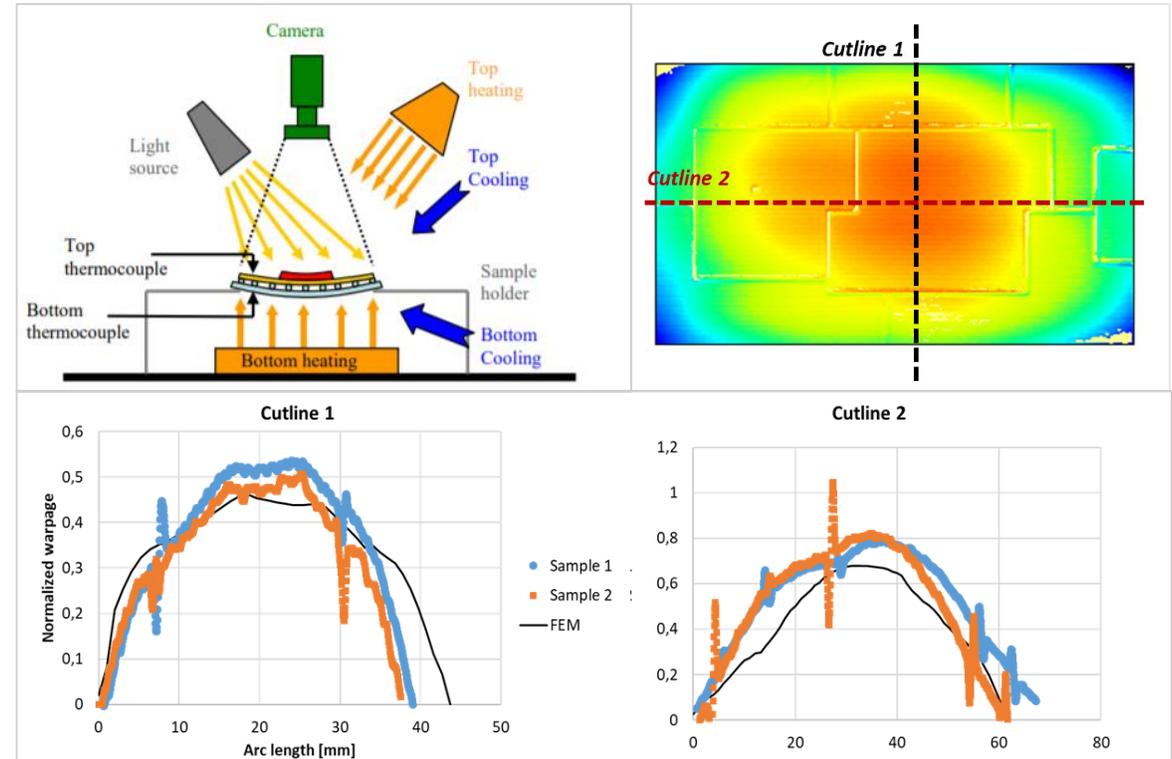
Analysis of warpage in substrates for power electronics



Equipment for tensile test



Tensile test results

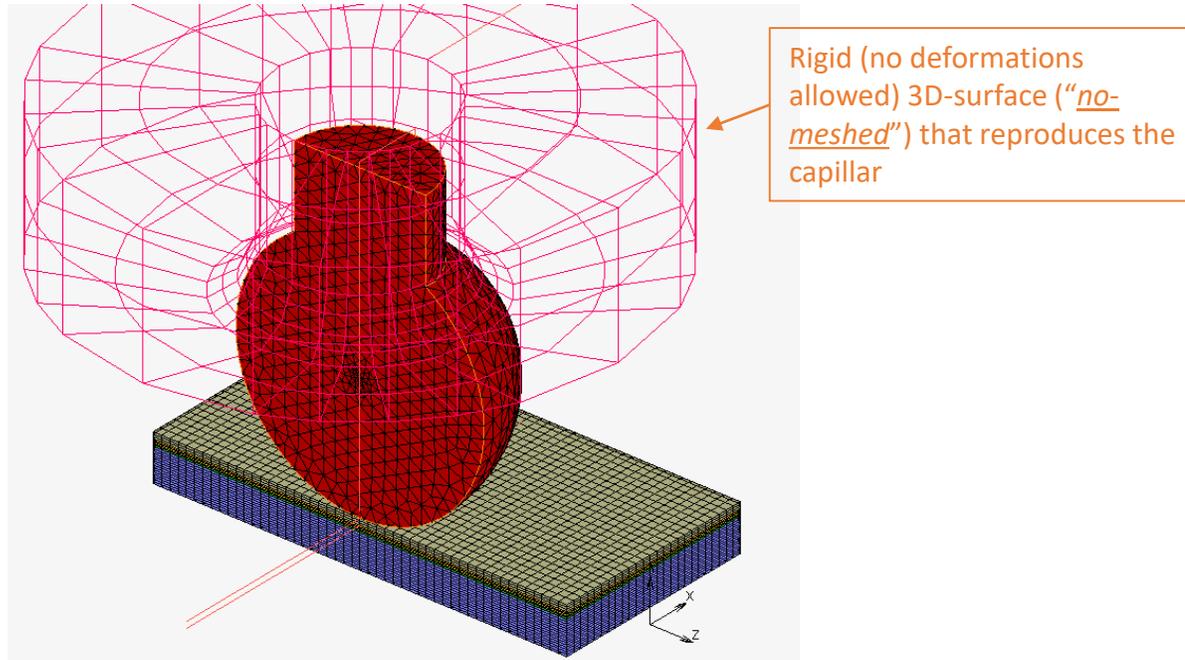


FEM and measured warpage behavior

Equipment for warpage measurements

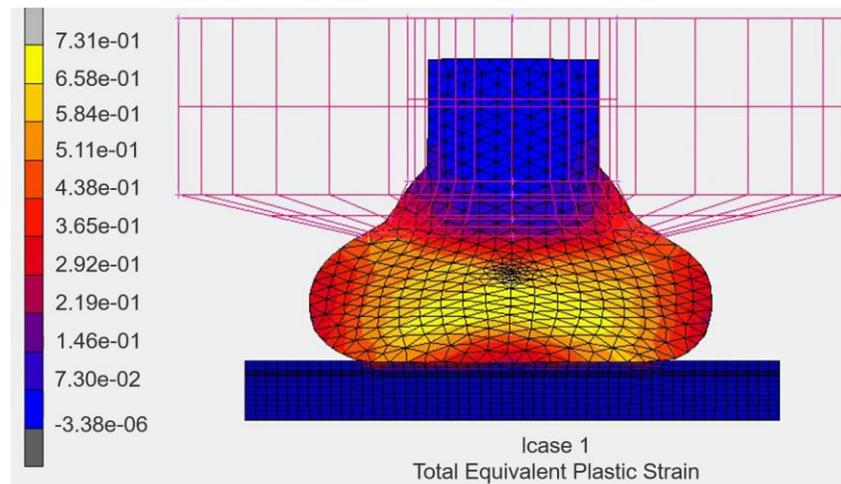
- Modeling of substrate warpage in operative conditions
 - Metal layer mechanical characterization
 - FE numerical model, benchmarked and validated with measurements

Wire bonding model



Finite Element Model for wire bonding

- Non-linear 3D model
 - Elastoplastic properties for Cu and AlCu
 - Contact formulation between capillary/ball and ball/pad
- Model input is the capillar displacement
- Boundary conditions:
 - Fixed displacement of rigid surface
 - Symmetry (1/2) condition
- Experimental analyses are ongoing



Calculated plastic strain after impact phase

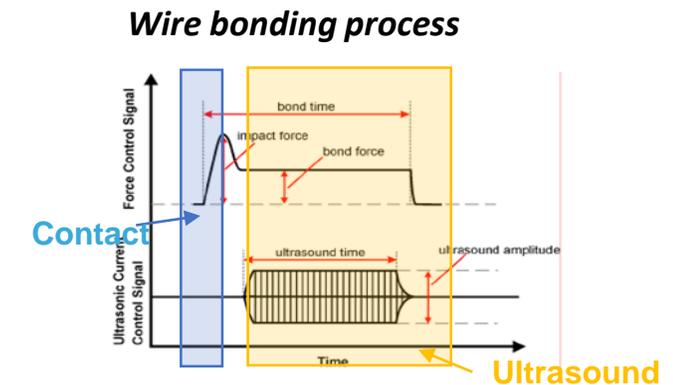


Figure 1.16: Parameter settings and control profiles during a wire bond.

Conference attendances



Design & Technology of Integrated Systems in Nanoscale Era, Taormina, 10-12 aprile 2018



47° Convegno Nazionale AIAS Villa San Giovanni, 5-8 settembre 2018



29th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis, Aalborg, Denmark, 1-5 ottobre 2018



PCIM exhibition, 7-10 Maggio 2019



Analysis of warpage in substrates for power electronics

1. Analysis of warpage in substrates for power electronics, Mirone G., Sitta A., Calabretta M., Barbagallo R., AIAS 2018 47° convegno nazionale
2. Material Characterization and Warpage Modeling for Power Devices Active Metal Brazed Substrates, Mirone, G., Sitta, A., D'Arrigo, G., Calabretta, M., IEEE Transactions on Device and Materials Reliability, 2019*
3. Caratterizzazione strutturale e modellazione del warpage dei substrati isolati per dispositivi di potenza, , Mirone, G., Sitta, A., D'Arrigo, G., Calabretta, M., Analisi e Calcolo, **in pubblicazione**

Wire Bonding Activity

4. Copper wire bonding process characterization and simulation, Mancaloni A., Sitta, A., Mirone G. et al., CIPS 2020 - 11th International Conference on Integrated Power Electronics Systems, in **revisione**

Warpage measurements

5. An Integrated Approach to Optimize Power Device Performances by Means of Stress Engineering, Calabretta M., Sitta., Oliveri S.M., Sequenzia G., In: Rizzi C., Andrisano A., Leali F., Gherardini F., Pini F., Vergnano A. (eds) Design Tools and Methods in Industrial Engineering. ADM 2019. Lecture Notes in Mechanical Engineering. Springer, Cham

Finite Element Simulation in PE

6. Design and Process Optimization of a Sintered Joint for Power Electronics Automotive Applications, , Calabretta M., Sitta., Oliveri S.M., Sequenzia G., In: Rizzi C., Andrisano A., Leali F., Gherardini F., Pini F., Vergnano A. (eds) Design Tools and Methods in Industrial Engineering. ADM 2019. Lecture Notes in Mechanical Engineering. Springer, Cham
7. Mechanical properties of amorphous Ge₂Sb₂Te₅ thin layers, D'Arrigo G., Oliveri S.M., Sitta A. et al., Surface and Coatings Technology, 2018, 355: 227-233.