Micro-testing of bonded components with very small dimensions

Graduate

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Objective: The goal is to develop testing methods to determine the fracture behaviour of adhesively-bonded sensor joints. The challenge consists in obtaining reproducible experimental results (standard deviation lower than 20%) with bonded specimens of very small dimensions.

Approach / Technology: To design and manufacture bonded specimens as well as bonding and testing jigs to experimentally measure the mechanical behaviour of very small bonded joints (1 to 2 mm2) up to fracture. Based on a literature research, different fixtures will be proposed in order to represent the mechanical behaviour of the adhesive layers under multi-axial and mixed-mode loading. A well known epoxy adhesive is used in order to avoid uncertainties due to the choice of the adhesive.

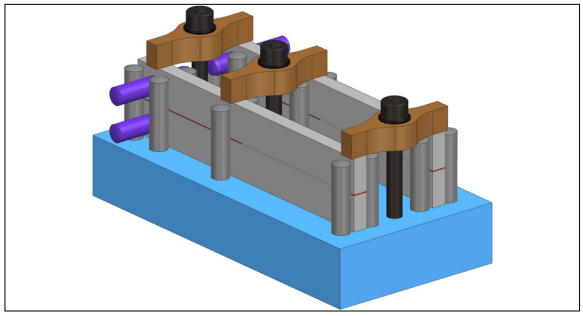
Result: Two different fixtures have been designed and manufactured and the following tests have been performed. The first fixture is dedicated to the reproducible sample bonding and preparation of Double Cantilever Beam specimens with an adhesive layer width of 1 and 3 mm. The second fixture is dedicated to the reproducible sample bonding, preparation and testing of the following specimens:

- Butt joint
- Scarf joint
- Shear force joint
- Pin-and-collar joint

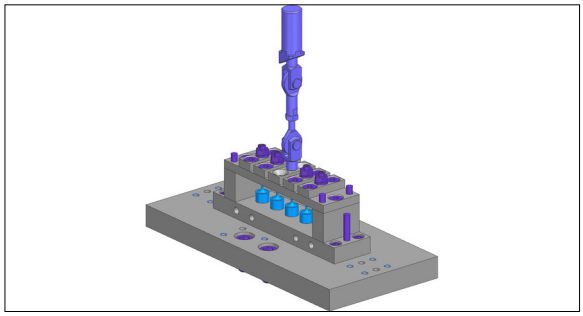
The resulting bonding process and experimental measurements reach the objectives of the project:

- The bonding process and geometry of the joint is defined precisely
- Tests results are reproducible
- The bonded area is not loaded when fixing the samples in the testing machine

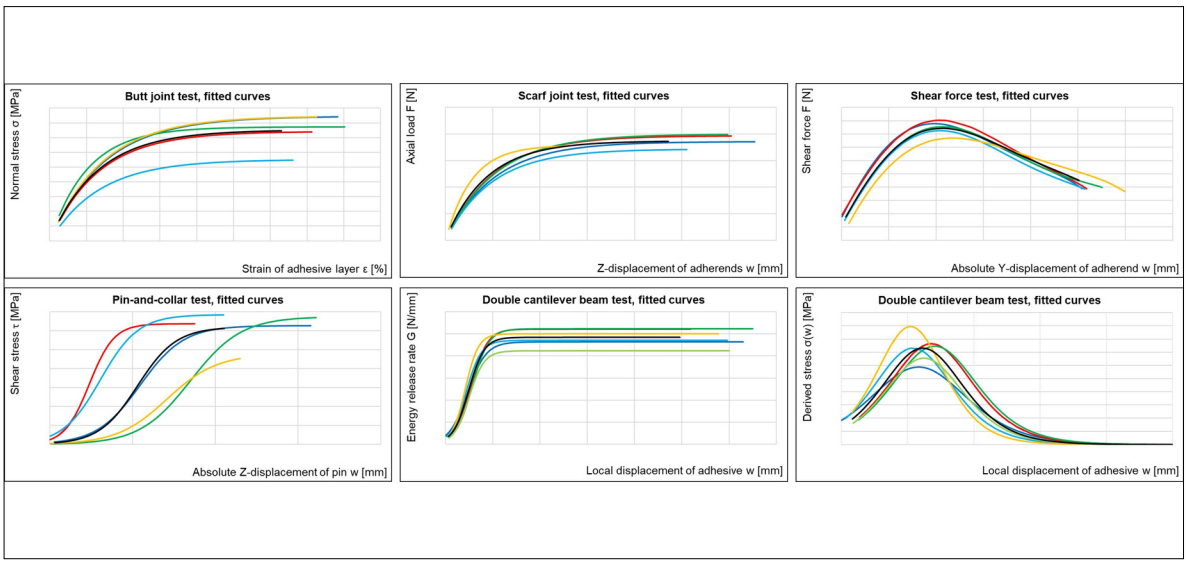
Double cantilever beam bonding fixture for a reproducible bonding process.
Own presentment



Multifunctional bonding and testing device for butt joint, scarf joint, shear and pin-and-collar tests.
Own presentment



Reproducible experimental results representing the mechanical behaviour of the different bonded specimens
Own presentment



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Subject Area
Plastics Technology

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