CertBond
COST Action CA18120

Material model of transparent adhesives for glass load-bearing structures

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Objectives / Description / Main outcomes

The aim of the STSM was to prepare material models of two adhesives for advanced numerical model of glass beam with double-lap adhesive joint. The adhesives - one stiff and one flexible epoxy adhesive were selected from the first part of the research where the influence of two artificial ageing methods and elevated temperature on mechanical and visual properties were tested.

Tensile tests of dog-bone specimens according to EN ISO 527 were performed before the STSM. Five specimens for each adhesive were prepared. First, the tensile tests data were evaluated. Stress-strain diagram and Poisson's ratio were obtained. Second, literature about material models and numerical modelling was searched. Different material models are possible to be used for adhesives - from linear elastic model, elastic-plastic model, viscoelastic model to the Cohesive Zone Model. As the material model gets more sophisticated, broader scale of input parameters is required and implementation is more complicated. Multilinear elastic model was chosen for these adhesives.

Third, material models in ANSYS Mechanical APDL were prepared. Only the middle part of the dog bone specimen was modelled. SOLID185 with 8 nodes was selected as element of the model. Multilinear elastic material model was defined with 7 points. The boundary conditions were set at one end of the model in order not to prevent transverse contraction of the specimen. The second end of the model was loaded by tensile surface load. Numerical model is shown in the Figure 1 and Figure 2. Forty ramped load substeps were set up in the solver. Comparison of the stress-strain diagrams from the experimental tests and from the numerical model is demonstrated in the Figure 3 and Figure 4.
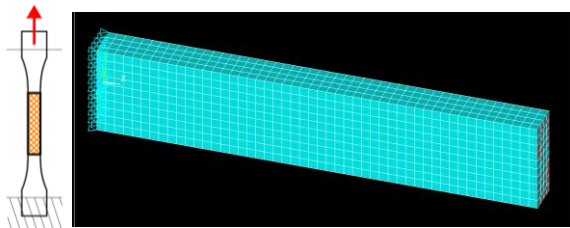

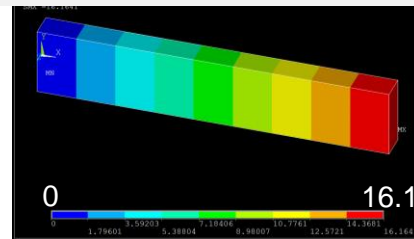**Figure 1:** *Schema and model in ANSYS*
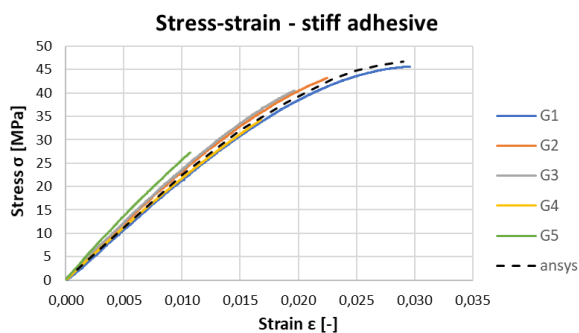

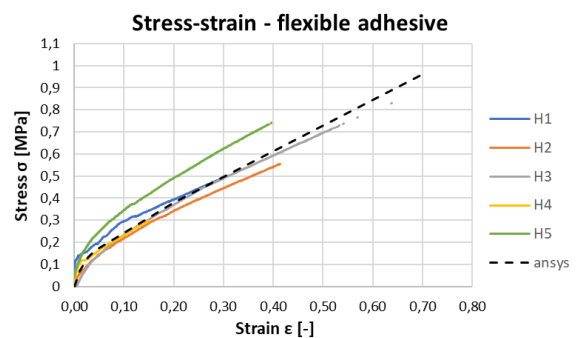**Figure 2:** *Displacement in X direction*

Figure 3: *Stress-strain diagram – stiff adhesive*

Figure 4: *Stress-strain diagram – flexible adhesive*