

Micro-Scale Experiments and Models for Composite Materials: Application of Strain Gauges in Soft Material Testing

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Current research presents measurement error evaluation of commonly used strain measuring devices – strain gauges. The gauge factor of the strain gauge is used to relate the relative electrical resistance change of the strain gauge with the strain of the underlying test sample. In practice, the gauge factor is found by the strain gauge manufacturer and is obtained from a calibration on relatively stiff materials. When the same gauge factor is applied for soft material testing, inaccurate measurements are obtained. In the current study, both experimental and numerical results showed significant errors even for moderately soft materials such as e.g. glass-fibre composites. Errors were found to be caused by the strain reduction in the specimen and the strain distortions in the strain gauge due to the stiffness discrepancy between the test sample and the strain gauge material. Experimentally strain field modifications were captured introducing digital image correlation method. Moreover, the effect of the specimen stiffness and geometry on different types of the strain gauges is presented by numerical parameter study based on 2D and 3D finite element calculations.