

ACCELERATED CHARACTERIZATION METHODS FOR GLASS FIBER REINFORCED COMPOSITES UNDER STATIC LOADS

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Composite materials, consisting of thermoset resin systems and unidirectional reinforcing fibers are used in various fields of high loaded structural application. One example, which gets more interest in the last decades, is the usage as high strength concrete reinforcing elements in the civil industry. In this application case, a complex loading profile based on mechanical stresses, primary static loads, thermal loads and environmental influences act to the composite material and hence change the material properties over the whole material lifetime. In order to characterize the long performance of corresponding composite materials for service times up to 100 years, accelerated test procedures and lifetime prediction concepts have to be applied in time efficient characterization process.

In this current study, the effect of static long term loading on the deformation and failure behavior of unidirectional glass fiber reinforced plastics (GFRP) with different fiber orientation is investigated. Various concepts for the prediction of creep and creep rupture behavior are evaluated for their applicability to GFRP materials. Corresponding experimental results are discussed, which provide a sound basis for the understanding of deformation and failure behavior of composites materials. The achieved research results established a necessary base to apply reliable concepts for service relevant long term prediction.