Abstract

In the present thesis a polyamide 6, reinforced with short glass fibres, under biaxial mechanical loading is characterised. The analysis comprises the general uni- and biaxial fatigue behaviour as well as the evolution of micro damage.
The fatigue behaviour of the biaxially loaded samples is described by the non-differentiating criterion of Tsai and Hill, which is adapted to fatigue loadings.
Test-related analysis of micro damage by the non-destructive method of X-ray-refraction analysis is carried out. The qualitative presence of the micro damage mechanisms supposed by the model is ensured by fractographic analysis.
Generally, the micro damage of short fibre reinforced thermoplastics is characterised by debonding between fibres and matrix, fracture of fibres and micro cracking in the matrix material. Dependent on the characteristic load the presence as well as the quantity of the particular mechanism changes. Thus, matrix-micro-cracking only appears in context with axial loading. In contrast, debonding between fibre and matrix appears in the damaged material, independent from the type of loading. The mechanisms of micro-damage, fibre-matrix-debonding and matrix-micro-cracking show a linear correlation to non-linear-elastic strains under static and fatigue loading ($R = 0.1$).