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Characterisation of the mechanical behaviour of semi-crystalline polymers under multiaxial loading

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Sustainable design of engineering components made of polymers requires the knowledge of their mechanical behaviour. Generally, these components are submitted to complex loading including multiaxial stress state. This latter may be due to initial geometrical defect or appear during the deformation. This work is devoted to semi-crystalline polymers subjected to monotonous tensile and creep tests. These materials eventually experience necking during the tests. A focus is set on this particular defect induced by the material's deformation. To this end, the tensile or creep curves will be described via some particular events including necking. Each event will be highlighted by performing 3D examinations (SEM, Tomography) of voids on arrested tensile specimens. The stress state being multiaxial, an inverse method of materials' coefficients optimisation is required, with the help of finite element code. An attempt is then made to link microstructural evolution thanks to various experimental techniques, to the macroscopic material behaviour during tensile and creep tests.

References

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