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INVARIANCE OF FINITE STRAIN VISCOPLASTICITY UNDER NON-ISOCHORIC CHANGE OF THE REFERENCE CONFIGURATION

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Since the geometrical complexity of formed metal parts increases continuously, multi-stage forming processes become more and more important. In this regard, numerical simulations of metal forming processes are used to minimize the efforts in producing prototypes. In order to represent the material behavior properly even at large deformations, the use of appropriate material formulations is inevitable. However, such formulations might be incapable to transfer the deformation history between different simulation models of multi- stage forming simulations. The formulation of finite strain viscoplasticity with nonlinear kinematic hardening used in our approach has been shown to be invariant under an isochoric change of the reference configuration [1]. This change is realized by transforming the internal state variables of the material model to the new reference configuration. However, multi-stage forming processes are not limited to isochoric deformations in general. Consequently, this approach shows a possible way to extend the transformation of internal state variables to non-isochoric changes of the reference configuration [2]. Additionally, this method is applied to different simulation examples, like the Presta joining process for assembled camshafts [3].

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