

Views on Material Forces in Multiplicative Elastoplasticity

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The main goal of this contribution is the examination of a general framework for finite hyper-elastoplasticity that reflects the nature of material forces. In particular, we thereby address representations of Eshelbian stress tensors and Eshelbian volume forces with respect to different configurations, namely the spatial, the material and – what we call – the intermediate setting which allows alternative interpretation as being referred to a local rearrangement. Deriving these relations, one naturally incorporates connections which are determined by either the irreversible or the reversible portion of the deformation gradient. The physical interpretation of these contributions consists in the fact that their skew part can be related to the, say, dislocation density. With these Eshelbian stress tensors and volume forces at hand, we finally come up with different representations of balances of linear momentum which are carried out with respect to the spatial or material setting, referring either to the spatial or to the material motion problem. The developed framework serves as the fundamental outset for the application of the material force method.

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