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An accurate continuum model for paperboard

K. Robertsson[1*], M. Wallin[1], E. Borgqvist[2], M. Ristinmaa[1] and J. Tryding[1;2]

[1] Division of Solid Mechanics, Lund University, Lund, 221 00, Sweden
[2] Tetra Pak Packaging Solutions, Lund, 221 86, Sweden
[*] kristofer.robertsson@solid.lth.se

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Paperboard is a highly anisotropic fibrous material with a large difference between the in-plane and out-of-plane properties. It is used by the packaging industry where the paperboard is creased, reducing its bending stiffness, and subsequently folded into a package. To be competitive, industrial processes must run at highest possible speed, and rate-effects will thus inevitably become significant.

Development of material models for paperboard is an active research field today, cf. the state-of-the art, rate-independent, continuum model by Borgqvist et al. [1]. Based on the framework by Borgqvist et al. [1], a viscoplastic continuum model for paperboard has been developed. For the calibration of the model, a set of experiments on a range of loading rates have been performed on single ply paperboard.

The line-creasing operation, previously investigated in [2], is reconsidered with the proposed rate-dependent framework. In contrast to the previous framework the new model is able to capture the relaxation of the paperboard thickness after the unloading phase, an important feature for further applications.

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