

A non-linear orthotropic hydrocode model for ultra-high molecular weight polyethylene in impact simulations

Lässig, T., Nguyen, L., May, M., Riedel, W., Heisserer, U., Van der Werff, H., Hiermaier, S.

2015, in International Journal of Impact Engineering, vol. 75, pp. 110-122. DOI: 10.1016/j.ijimpeng.2014.07.004.

Abstract

This paper presents detailed experimental characterization of quasi-static anisotropic directional strength properties as well as the shock behavior of ultra-high molecular weight polyethylene (UHMWPE) for the development of an advanced material model for this class of materials. Specifically, we consider Dyneema[®] HB26 - pressed from uni-directional (UD) tapes in a 0/90° stacking sequence. A material model based on a constitutive law with orthotropic, non-linear strength, shock response, composite failure and softening criteria is presented. A set of material parameters is derived for applications in hydrocodes (here: ANSYS AUTODYN). High- and hypervelocity impact tests with different impact velocities are used for preliminary validation and discussion of the predictive capabilities in view of future application.