

Accepted Manuscript

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PII: S0749-6419(17)30304-2

DOI: [10.1016/j.ijplas.2017.08.007](https://doi.org/10.1016/j.ijplas.2017.08.007)

Reference: INTPLA 2237

To appear in: *International Journal of Plasticity*

Received Date: 24 May 2017

Revised Date: 5 August 2017

Accepted Date: 29 August 2017

Please cite this article as: Lee, E.-H., Stoughton, T.B., Yoon, J.W., A yield criterion through coupling of quadratic and non-quadratic functions for anisotropic hardening with non-associated flow rule, *International Journal of Plasticity* (2017), doi: 10.1016/j.ijplas.2017.08.007.

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A yield criterion through coupling of quadratic and non-quadratic functions for anisotropic hardening with non-associated flow rule

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Abstract

This paper proposes a simple coupling of quadratic and non-quadratic yield functions with a non-associated flow rule to describe the evolution of yield surface (or anisotropic hardening). The non-quadratic part is an isotropic function and is supposed to control curvature of the whole model. The quadratic part takes a role to describe anisotropic hardening throughout a deformation history by employing the hardening functions of different loading conditions. The new yield model just multiplies a quadratic and non-quadratic parts, and it does not need neither any interpolation nor optimization at a discrete level of equivalent plastic strain. The new model is compared with several material models with four different material data in order to validate advantages of the new model in capturing anisotropic hardening and controlling its curvature of yield surface. In addition, artificial material cases are applied to the new model to study sensitivity of the model.

Keywords : Yield surface, Quadratic yield function, Non-quadratic yield function,

Anisotropic hardening, Non-associated flow rule

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