

论文

## 基于微面有效应力矢量的各向异性屈服准则

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**摘要** 基于微面模型, 定义损伤变量为微面上有效承载面积的减少. 将Kachanov的一维有效应力概念推广到三维, 提出微面有效应力矢量的概念. 根据微面的有效应力矢量, 将无损材料的宏观应力张量及不变量与微面应力矢量的积分关系拓展到有损材料, 得到了有损材料的宏观有效应力张量及其不变量与宏观名义应力张量、微面面积损伤组构张量之间的关系. 将无损材料的以应力张量不变量表示的Drucker-Prager准则推广到有损材料, 建立了含缺陷材料的各向异性屈服准则. 对有损材料, 宏观有效应力张量与Murakami的有效应力张量具有相同的形式, 各向异性强度准则与Liu等提出的扩展Hill准则有相同的形式, 当不考虑静水应力对屈服的影响时, 它与Hill准则具有相同的形式.

**关键词** [微面](#), [有效应力矢量](#), [各向异性](#), [屈服准则](#), [组构张量](#)

分类号

## Anisotropic yield criterion based on microplane effective stress vector

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### Abstract

In this paper, based on microplane model, the damage variable is defined as the reduction of loading area on microplanes, which is a scalar-valued ODF(Orientation Distribution Function). Kachanov's effective stress in one dimension is generalized to three dimension by introducing the concept of effective stress vector on microplanes. According to the concept of microplane effective stress vector, the integral relations between macro stress tensor, its invariants and stress vector on microplanes for virgin material are generalized to damaged material by replacing invariants of macro stress tensor as its effective counterparts. For damaged material, macro effective stress tensor and its invariants can be expressed as the functions of macro nominal stress tensor and fabric tensors of microplane damage. An anisotropic yield criterion is obtained for damaged materials by extending Drucker-Prager yield criterion. It is shown that macro effective stress tensor has the same form with Murakami's effective stress tensor and the anisotropic yield criterion has the same form with the phenomenological yield criterion proposed by Liu et al. When hydrostatic stress has no influence on material yield such as metals, the anisotropic yield criterion has the same form with Hill's anisotropic yield criterion.

**Key words** [微面](#) [有效应力矢量](#) [各向异性](#) [屈服准则](#) [组构张量](#)

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