Formation of shear bands in crushable and irregularly shaped granular materials and the associated microstructural evolution

Gang Ma, Wei Zhou, Xiao-lin Chang, Tang-Tat Ng, Li-fu Yang

PII: S0032-5910(16)30323-0
DOI: doi: 10.1016/j.powtec.2016.05.068
Reference: PTEC 11708

To appear in: *Powder Technology*

Received date: 26 January 2016
Revised date: 22 May 2016
Accepted date: 31 May 2016

Please cite this article as: Gang Ma, Wei Zhou, Xiao-lin Chang, Tang-Tat Ng, Li-fu Yang, Formation of shear bands in crushable and irregularly shaped granular materials and the associated microstructural evolution, *Powder Technology* (2016), doi: 10.1016/j.powtec.2016.05.068

Formation of shear bands in crushable and irregularly shaped granular materials and the associated microstructural evolution

Gang Ma[a], Wei Zhou[a], Xiao-lin Chang[a], Tang-Tat Ng[b], Li-fu Yang[a]

[a] State Key Laboratory of Water Resources and Hydropower Engineering Science, Wuhan University, Wuhan 430072, China

[b] Civil Engineering Department, University of New Mexico, Albuquerque, NM 87131, USA

Corresponding author at: State Key Laboratory of Water Resources and Hydropower Engineering Science, Wuhan University, Wuhan 430072, China.
E-mail address: zw_mxx@whu.edu.cn

1. Introduction

Granular materials have a wide spectrum of characteristics and phenomena that distinguish them from liquids and solids. One ubiquitous feature of granular materials is the formation of shear bands. Many geotechnical failures are characterized by bifurcation and spontaneous localization of deformation into rupture zones.

Experimental evidence has shown that the failure of plane strain (PS) specimens always occur along a well-defined shear plane [1-3]. When a specimen is subjected to conventional triaxial compression (CTC), it fails with either a localized shear plane or a bulging shape with no clearly defined shear bands [4]. Shear band formation and evolution also occur in true triaxial tests [5,6], ring shear tests [7], plane strain extension [8], and static and cyclic torsional shear tests [9,10]. These experimental studies have revealed that the shear band formation is influenced by several factors, including the porosity, the inherent and stress-induced anisotropy, the particle size and shape of the material, and the level of confining stress.