EXPANDED PERLITE AS A MODEL MATERIAL TO STUDY THE ROLE OF GRAIN STIFFNESS AND STRENGTH IN GRANULAR MEDIA

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The importance of grain crushing/breakage on the mechanical behavior of soils is well documented experimentally in a number of publications [1, 4, 5, 6, 7, 10]. On a parallel line of research, the micromechanics of grain crushing phenomena in granular media have been investigated by using advanced Distinct Element Method simulations combined with probabilistic analyses [8]. Besides these basic research issues, recently, catastrophic landslide phenomena have been attributed to liquefaction of thin zones, where severe grain crushing and pore-pressure build up occurs [9, 12].

In this paper we present a series of triaxial and biaxial compression tests on expanded perlite, which is proposed to serve as a model granular material with deformable, soft, porous and crushable grains. In other words the grain of a perlite possesses all properties of a deformable porous medium. In particular, dry and water-saturated expanded perlite is tested against isotropic and deviatoric, drained and undrained compression. Sieve curve analysis as well as thin sections of the intact and the tested material verify the severe grain deformation and crushing, occurring during isotropic and deviatoric stress paths [3]. The central aim of the current work is to highlight the importance of grain stiffness and strength on the overall macroscopic strength of the specimen as well as to provide some insight on various compaction instabilities, like compactive shear-banding and compression-induced liquefaction [2], [11].

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Keywords: crushing, breakage, shear-band