World Academy of Science, Engineering and Technology
International Journal of Computer and Systems Engineering
Vol:16, No:07, 2022

Discrete Element Method Simulation of Crushable Pumice Sand

Authors : Sayed Hessam Bahmani, Rolsndo P. Orense

Abstract : From an engineering point of view, pumice particles are problematic because of their crushability and compressibility due to their vesicular nature. Currently, information on the geotechnical characteristics of pumice sands is limited. While extensive empirical and laboratory tests can be implemented to characterize their behavior, these are generally time-consuming and expensive. These drawbacks have motivated attempts to study the effects of particle breakage of pumice sand through the Discrete Element Method (DEM). This method provides insights into the behavior of crushable granular material at both the micro and macro-level. In this paper, the results of single-particle crushing tests conducted in the laboratory are simulated using DEM through the open-source code YADE. This is done to better understand the parameters necessary to represent the pumice microstructure that governs its crushing features, and to examine how the resulting microstructure evolution affects a particle's properties. The DEM particle model is then used to simulate the behavior of pumice sand during consolidated drained triaxial tests. The results indicate the importance of incorporating particle porosity and unique surface textures in the material characterization and show that interlocking between the crushed particles significantly influences the drained behavior of the pumice specimen.

Keywords : pumice sand, triaxial compression, simulation, particle breakage
Conference Title : ICDMMCSPMDEM 2022 : International Conference on Discrete Multiphysics, Modelling Complex Systems with Particle Methods and Discrete Element Method
Conference Location : Stockholm, Sweden
Conference Dates : July 12-13, 2022