

Role of inter-particle friction in three dimensional mechanics of granular materials — PARTICLES 2019

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ABSTRACT

Inter-particle friction is known to be an important contributor to the strength and deformation at macroscopic level in granular materials^[1]. The mechanism of inter-particle friction to the macroscopic responses can be explained by microscopic statistical investigations^[2]. Based on the discrete element method (DEM), a series of true triaxial test for granular materials are carried out and the effects of inter-particle friction coefficient (μ) on the evolutions of macro- and micromechanical parameters of granular materials are studied. The macroscopic stresses, the distribution of coordination numbers with regard to strong and weak contact systems and the fabric and force anisotropies are concerned. Findings indicate that the increasing inter-particle friction sharpens the peak value of shear stress and enhances the degree of dilatancy of the specimen at the macroscopic level. From the microscopical perspective, the distribution of the coordination number of the weak contact system varies dramatically, while the number of particles with smaller coordination number in the strong contact system changes little with different μ . As inter-particle friction coefficient is increasing, the difference between strong and weak contact systems is enlarged, and anisotropy indicators are significantly enhanced, which strengthens the bearing ability of anisotropic stresses in granular materials.

Key words: DEM, inter-particle friction, true triaxial tests; strong and weak contact system; coordination number ; anisotropy

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