

Micromechanical Study of Macroscopic Friction and Dissipation in Idealised Granular Materials: The Effect of Interparticle Friction**N.P. Kruyt**⁽¹⁾, L. Rothenburg⁽²⁾*(1) University of Twente, Enschede, Netherlands**(2) University of Waterloo, Waterloo, Canada*

Using Discrete Element Method (DEM) simulations with varying interparticle friction coefficient, the relation between interparticle friction coefficient and macroscopic continuum friction and dissipation is investigated. As expected, macroscopic friction and dilatancy increase with interparticle friction coefficient. Surprisingly, dissipation is present even for zero and infinite interparticle friction coefficients when there is no microscopic frictional dissipative mechanism. Thus dissipation in idealised granular materials is not exclusively due to interparticle friction. By performing additional DEM simulations of unloading paths, the plastic strains were determined. The dependence of the dissipation-rate function on plastic strains is investigated. A specific form for the dissipation-rate function is formulated, based on the results of the DEM simulations. Furthermore, it is shown that there is no significant recoverable plastic work.

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