

## **On the Mechanics of Fibre-Reinforced Sand**

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**Abstract:**

The addition of flexible, discrete fibres to granular, cohesionless soils, has a marked influence on the stress-strain and volumetric response, and appears as an attractive engineering solution, as it offers the potential to enhance soil strength in all loading directions and promote behaviour resembling that of a stronger isotropic material. However, evidence from published research suggests that fibre inclusion does not necessarily lead to isotropic mechanical properties in reinforced soils. In fact, recent laboratory experimental studies on fibre-reinforced sands using conventional triaxial testing have revealed contrasting behaviour: while fibres can produce a substantial increase in strength under compression loading, their influence on ultimate strength under extension loading is almost negligible. In addition, unusual volumetric responses have been observed. Two features are particularly important: the distribution of the orientations of fibres and the allowance for the volume of void space not only occupied, but also influenced, by the presence of the fibres. This lecture examines these key aspects and their role in fibre-grain interaction mechanisms through a combination of approaches, ranging from X-ray and element scale experimental investigations to continuum constitutive modelling.