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# Micro-mechanical behaviour of Geo-materials: Advanced Multi-scale Experimental Characterisations and Modelling

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**Key words:** Geo-Mechanics, Micromechanics, Photo stress analysis tomography, Digital particle image velocimetry, DEM, Physical modelling

## ABSTRACT

Scientists and engineers seek new understandings on the micromechanical behaviour of granular materials in a number of engineering disciplines including geotechnical, chemical, mechanical, minerals, petroleum, material processing, sensors and granular physics. Furthermore, the current developments in fabricating particulate materials at bulk scale from properties of molecular scale [1] through nano and micro scales offer significant opportunities and challenges to the researchers [2].

Granular materials exhibit a spectacular variety of unusual and unpredictable characteristics under different loading environments - they behave differently from conventional solid, liquid and gaseous matter [2-6]. The mechanical behaviour of particulate materials is extremely complex when viewed at micro scale and below. In spite of the extensive level of research carried out in the past, fundamental understandings on how single-grain scale properties contribute to the mobilisation of strength characteristics in different geo-materials is not yet well established. In this presentation, we will provide new understandings on the stress distribution characteristics of two types of geo-materials namely dry sand and sandstone rock at different length scales. The research involves multi-disciplinary approaches and different methodologies, including photo-stress analysis tomography, thermal tomography, digital particle image velocimetry, atomic force microscopy, analytical and discrete element modelling. New results on the stress distribution and velocity distribution of grains at both micro-scale and bulk scale and the links between them under different loading environments will be demonstrated in this presentation.

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**Acknowledgement:** This publication was made possible by NPRP grant # 6-1010-2-413 from the Qatar National Research Fund (a member of Qatar Foundation). The statements made herein are solely the responsibility of the authors.