

## **CONTACT COMPLIANCE HARDNESS INDENTATION TECHNIQUES IN ENGINEERING GEOLOGY**

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In geomechanics there always have been efforts for finding the most from laboratory tests. Trouble is usually found at the time of handling sensitive samples, such as quick clays or, as in this case, gels. Hardness techniques are an option for testing such difficult materials, although they work well also for harder bodies. In the indentation hardness test an indenter is introduced on the sample surface inducing a localized deformation, becoming a near non-destructive technique.

The contact compliance technique measures in a continuous way the reaction force to the indentation process, as a function of the depth of penetration, producing a curve having both the loading and unloading stages. From the force-indentation curves, the rheology of the tested samples is found as follows: for a perfectly elastic soil or rock the loading and unloading curves coincide; for a perfectly plastic material there is no elastic recovery in the unloading stage, falling straight; for elastoplastic bodies, the most common, the unloading behaviour is intermediate.

The mechanical properties of sensitive laboratory produced silica-gels having different water contents were followed with the hardness tests, indenting cones. The results show how dramatically the strength of the material is a function of the moisture content. The gels were more elastic and ductile when wet, in contrast with the dried stage, in which they had a much higher strength tough. The general rheological response of the gels is that of a complex visco-elastic-plastic material, as shown with the loading-unloading compliance curves.