

Abstract

The mechanical behaviour of natural clays is influenced by the degradation of the structure developed during and after deposition. In order to model the influence of structure artificially cemented specimens have been prepared. A series of one-dimensional compression tests of cement treated kaolin specimens were analysed. The effect of bonding and debonding on compression of the specimens was observed. The compression of cemented specimens was not monotonic, depending on disturbance of the structure. Cement content and curing period were found the main factors influencing the compressibility of cement treated kaolin clay. The possibility of using cement treated kaolin to model naturally cemented soil was confirmed.

For the purpose of the research described in this dissertation, artificial cementation bonds were created in a model clayey material by adding 4% of Portland cement to kaolin clay. The mechanical behaviour of the model material at compression and shearing was compared with the behaviour of the pure reconstituted kaolin clay. Triaxial CIUP tests were carried out in determining the shear strength. Submersible LVDT's and bender elements were used for measuring of the shear modulus to identify the destructure of the specimens. The experimental behaviour was successfully simulated by the hypoplastic model.

Finally, the shear modulus of cemented soils at very small strain (G_0) was studied. For artificially cemented clay, G_0 was found to be independent of the mean effective stress until the yield stress. After yield, a significant effect of structure degradation on G_0 was observed. The experimental data were interpreted by an equation, which relate G_0 of cemented soils to mean stress, apparent overconsolidation ratio and the state of structure (sensitivity). The equation was also found to represent G_0 of cemented sands.