YIELD AND FLOW IN AGGREGATED PARTICULATE SUSPSENSIONS IN WATER

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ABSTRACT

Understanding the compressive strength or resistance to consolidation of aggregated particulate suspensions is relevant to processes such as filtration, centrifugation and gravity settling, where the compressive strength defines an upper boundary for processing. New data for the compressive strength of consolidating flocculated particulate suspensions in water from our own laboratories, including alumina and calcium carbonate, are compared with earlier data from the literature. The three sets of data for the compressive strength of alumina agree well. Differences are noted for data measured in shear between our own laboratories and others. New data for the shear strength of an alumina are also presented and, although the agreement is not as good, the difference is implied to be due to wall slip associated with a difference in measurement techniques[1].

A simple non-linear poro-elastic model of the compressive strength was applied to the eight sets of compressive strength data and was found to account for most features of the observed behaviour. The agreement strongly supports the mechanistic failure mode in compression for these systems to be one of simple strain hardening. The one feature that it does not account for is the observed irreversibility of consolidation. It is however suspected that wall adhesion might provide such a ratchet in reality, since wall adhesion has been neglected in the analysis of raw compressive strength until recently, notwithstanding the pioneering work of Michaels and Bolger[2]. Overall, the data analysis and fitting indicate a limited data set in both compression and shear, can now be used to predict comprehensive curves for the shear yield stress and compressive yield stress of samples using a simple poro-elastic model.

REFERENCES

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