SLIP BEHAVIOUR AND THIXOTROPY OF KAOLINITE AND MATURE FINES TAILINGS

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ABSTRACT

The rheological characteristics of kaolinite suspensions and mature fine oil tailings (MFT) were examined in both the linear and non-linear viscoelastic regimes. Both systems exhibited apparent slip, which was suppressed by using sandpaper of grit 80 (200 microns) at the wall of the parallel-plate geometry. The true yield stress with shear-thinning behaviour was determined by fitting the Herschel-Bulkley model. The presence of bitumen remaining in the MFTs (up to 2 wt%) suppressed the apparent slip to a large extent due to the immobilization of the particles at the interface. Ionic surfactants, namely sodium dodecyl sulfate (SDS) and cetyltrimethylammonium bromide (CTAB), were added to both kaolinite suspensions and MFT. SDS was shown to cause thinning and decreasing yield stress, while CTAB caused gelation and increasing yield stress. The yield stress of two MFT suspensions possessing similar volume fractions was found to be similar, however, kaolinite suspensions (formulated to mimic/match the MFT rheology) showed more shear thinning. MFT samples were found to be thixotropic while kaolinite suspensions exhibited antithixotropy. This thixotropy is explored to understand differences in network structure of both suspensions.