

ABSTRACT

**The influence of lignosulphonic acid, sodium salt, acetate on the properties of
Trinidad Portland cement.**

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This thesis presents the results of a study of the influence of a surfactant, lignosulphonic acid, sodium salt, acetate, on the properties of Trinidad Portland cement.

Dialysis, conductometric and calorimetric studies on mixtures of cement admixtures were investigated and results indicate the absence of binding between Ca^{2+} ions to the ligand. These results contradict binding interactions (between Ca^{2+} and the admixture ligand) proposed in the older mechanism used to explain the delay of the cement hydration process when admixtures are incorporated in them. Experimental evidence in this thesis supports the non-linear 'clock-like' kinetic model proposed by Billingham and co-workers. This model associates the delayed hydration process with a coating of the ettringite gel on the tricalcium silicate grain. Only on conversion of the ettringite gel form to the ettringite crystalline form, does the normal hydration process resume.

The effects of the surfactant at various concentration levels (0, 0.05, 0.1, 0.3 and 0.5%) on the physical and mechanical properties of Trinidad Portland cement were investigated.

Mixtures containing 0.05% surfactant concentration produced a material that had higher compressive strengths, lower porosity, higher density and lower water absorption capacity than in the absence of surfactant. Increasing the concentration of the surfactant ($>0.05\%$) resulted in a material with increasing porosity, increasing water absorption capacity and decreasing bulk density. In addition at surfactant concentrations $>0.05\%$, the material had increasingly higher compressive strengths except for the samples containing 0.5% surfactant concentration. In this case, the compressive strengths were lower than samples without added surfactant.