Quick Guide

Sibelco Quick Guide to: **Soluble salts**

1. What is the impact of soluble salts?

Soluble salts can have a significant impact on the viscosity and plasticity of ceramic systems when they are present at sufficiently high levels.

The difficulty for ceramics manufacturers lies in the fact that they're not only naturally occurring within some ceramics raw materials, they can also be introduced by various sources during the production process - and some are incredibly difficult to control.

Take sulphate as an example. If high levels of sulphate are present and not controlled, very high viscosities result, which makes ceramic processing almost impossible.

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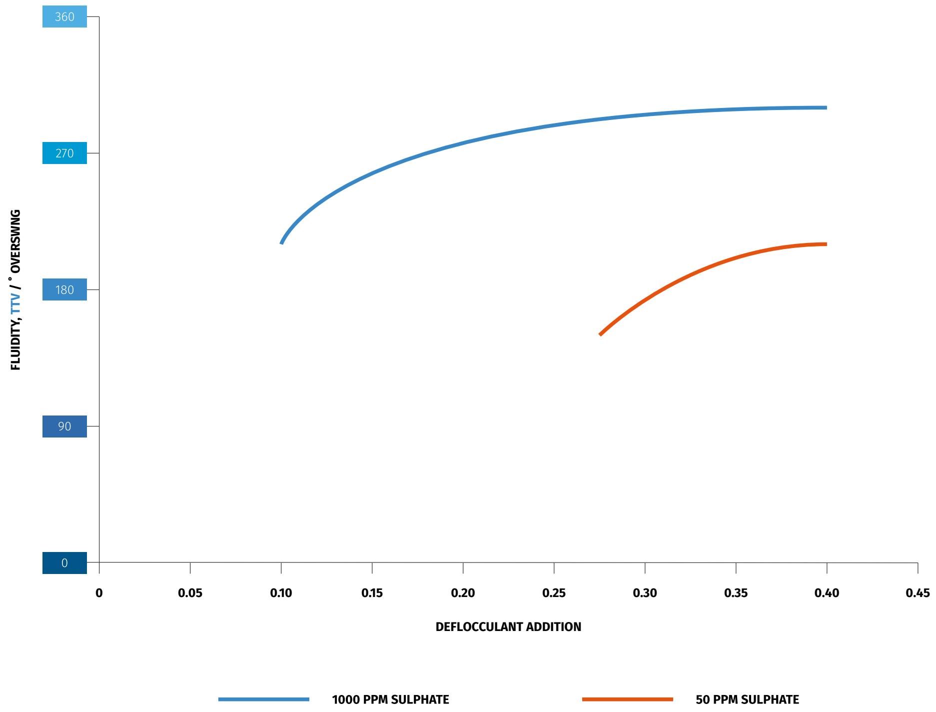
Figure 1: Influence of Sulphate Content on the Viscosity of a Plastic Slip



2. How can soluble salts be controlled?

Certain soluble salts can be controlled or through the careful introduction of chemicals that act as a counter-balance or neutraliser.

Calcium levels, for example, are controlled in casting slips by the use of sodium carbonate as part of the deflocculant. This results in the formation of insoluble calcium carbonate.

In addition, certain environmental steps can be taken to prevent contamination. The most difficult to control ion in the ceramic system is undoubtedly the chloride ion. No practical means exist to render its effects impotent, so it's vital to avoid contamination from seawater.

3. How do we measure soluble salts?

Before soluble salts can be measured, they must first be extracted from the mineral sample. The material is mixed with high purity de-ionised water, then filtered to produce a clear liquid ready for analysis.

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The total soluble salt content is measured by carefully evaporating a sample of the solution to dryness in a weighted platinum crucible, and then reweighing.

In order to measure the component ions in the solution, the sample is injected into a liquid stream, which passes over an ion exchange resin in a column, to which any salts in the sample bond temporarily to the resin.

The next step in the process, which is called ion chromatography, sees the salts washed off again by the ever-flowing stream of eluent. Those ions which adhere only lightly, such as chloride, are washed out first. Those which are more firmly bonded to the resin, such as sulphate, wash out later.

Essentially, the ions that went into the resin filled column as a mixture, emerge as separate, sequential components. Small platinum electrodes in the emerging liquid stream continuously measure conductivity – as an ion emerges and passes between the electrodes, the conductivity rises, falling again once the ion has passed.

The changes are recorded by computer software, with any 'peaks' proportional to the amount of that ion in the solution. The resultant data can be used to determine and advise on a multitude of solutions to specific issues, such as the quality of process waters or contamination issues.

In the example below, a primarily sodium chloride solution has been found to contain a very small amount of bromine, at a ratio of 288:1. Establishing the concentration of these ions and the ratio, allows us to confirm sea water contamination of clays and kaolin.

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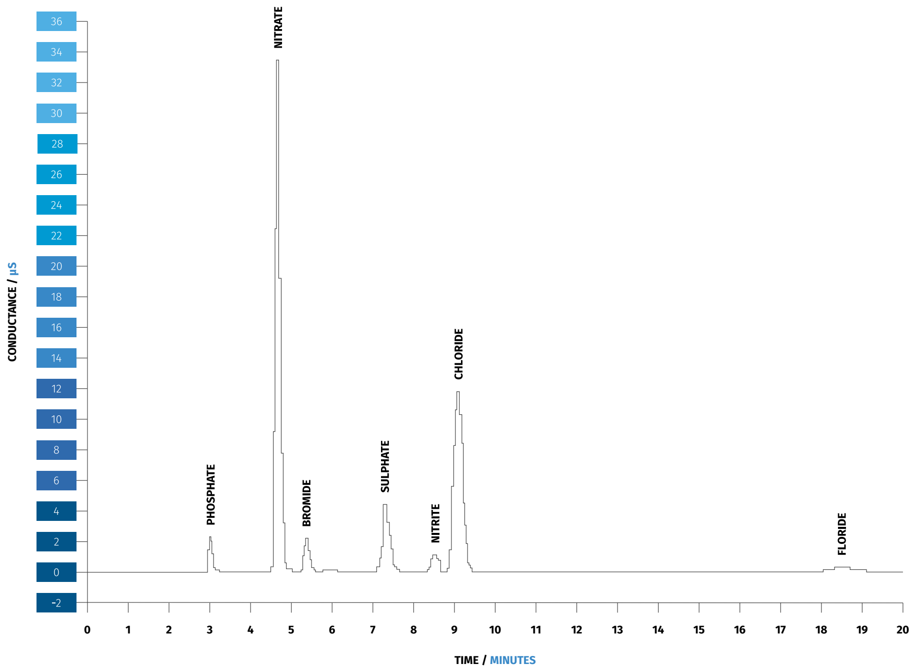
Figure 2: Analysis of a plastic clay contaminated with sea water



Are you having issues with soluble salts? Find out more about our measurement process by signing up for a TechTalk with our ceramics specialists.

TechTalk is a fast, Skype-based consultation service, connecting ceramics producers with the Sibelco experts to discuss any technical issues around raw materials usage.

Get started with a free, hour-long TechTalk here.