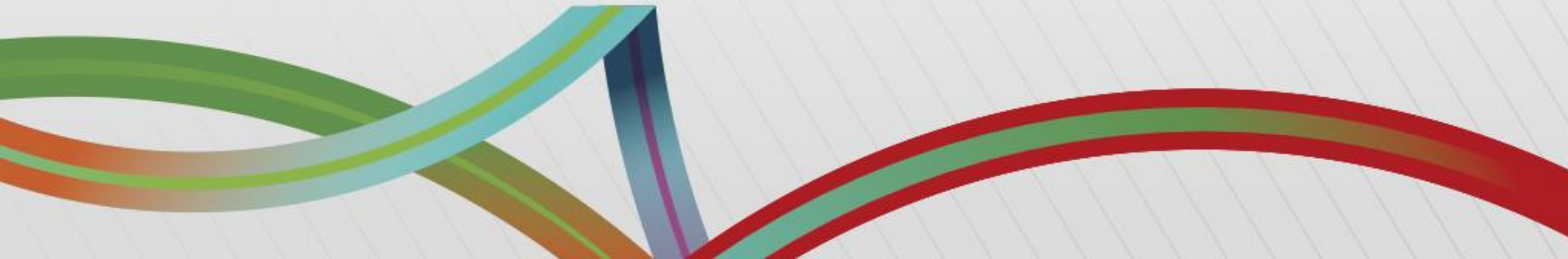




Where needs take us

IMPACT OF SAMPLE PREPARATION ON RESULTS OF POLYHALITE FERTILISER ANALYSIS



- Polysulphate is a natural fertiliser produced by ICL UK.
- It contains four essential plant nutrients: potassium, sulphur, magnesium and calcium.
- Agronomy work has proven that all nutrients are available for crop uptake.
- Polysulphate is produced by crushing and screening polyhalite ores. No other chemical or physical processes are involved. This makes the product suitable for organic agriculture.
- The main component of Polysulphate is Polyhalite ($\text{K}_2\text{Ca}_2\text{Mg}(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$). It also contains other minerals (mainly halite and anhydrite).

Typical mineralogical composition of Polysulphate product

Component	Chemical formula	Unit	Typical content
Polyhalite	$K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$	%	≥90
Halite	NaCl	%	0-5
Anhydrite	CaSO ₄	%	0-5
Magnesite	MgCO ₃	%	0-3

- Traces of other minerals such as magnesite, gypsum, and carnalite can also be present in Polysulphate.
- The nature and mineralogical characteristics of Polysulphate make it a challenging product to handle in the laboratory.

Physical properties of minerals identify in Polysulphate product

Mineral	Hardness	Density
Polyhalite	2.5-3.5	2.78
Halite	2.5	2.16
Anhydrite	3-3.5	2.9
Magnesite	3.5-4.5	2.9-3.02
Gypsum	2	2.3
Carnallite	2.5	1.6

- The European method requires that samples with marked differences in texture and mechanical properties be ground to pass through a sieve aperture of 0.18 mm.
- We have found that due to the mineralogical composition and natural variation, samples ground to pass through a maximum sieve size of 0.20 mm yield chemical test results that are more accurate and repeatable

- Studies to test the effect of grind size on nutrient content of polysulphate have been conducted.
- Duplicate samples of 4 different polysulphate batches (standard and granular) were prepared.
- The samples were ground to two grind sizes, namely to pass a 500um and a 200um sieve.
- Water soluble K_2O was analyzed by using the official AOAC 958.02 method by an independent laboratory.
- Samples were also tested and were known to be in specification according to EU method EN 15477.

Granular Grade tests Results

GRANULAR POLYSULPHATE – TYPICAL 14.0% K₂O

Sample	Product	K ₂ O% (<500um) AOAC 958.02	K ₂ O% (<200um) AOAC 958.02	K ₂ O% (<200um) EN 15477 (For reference)
1	GRN 1	13.01%	13.91%	14.1%
2	GRN 1 (Duplicate)	13.67%	13.92%	14.2%
3	GRN 2	13.12%	13.79%	14.0%
4	GRN 2 (Duplicate)	12.93%	13.84%	14.1%

- Higher K₂O values were obtained for samples ground to less than 200um against those tested by current standard practice (500um).
- Results show better repeatability of the K₂O tests for the samples ground to less than 200um.

Standard Grade Tests Results:

STANDARD POLYSULPHATE – TYPICAL 13.5% K₂O

Sample	Product	K ₂ O% (<500um) AOAC 958.02	K ₂ O% (<200um) AOAC 958.02	K ₂ O% (<200um) EN 15477 (For reference)
5	STD 1	13.08%	13.23%	13.6%
6	STD 1 (Duplicate)	12.81%	13.22%	13.5%
7	STD 2	13.00%	13.56%	13.7%
8	STD 2 (Duplicate)	12.49%	13.60%	13.8%

- Higher K₂O values were obtained for samples ground to less than 200um than those for samples ground to less than 500um.
- The results show better repeatability of the K₂O tests for the samples ground to less than 200um.

- Test results of both product grades show higher soluble potassium oxide content in samples ground to pass 200um sieve than in samples ground to pass 500um sieve. This is in line with previous experiences in Europe and other international markets.
- Similarly, results obtained for samples ground to pass 200um sieve are more repeatable and accurate than when ground to pass 500um sieve. This is consistent with previous work.
- There is a consistent difference in results between EU and US methods at 200um; both are generally within a tolerance of 0.3% of each other and considered to be an acceptable level of accuracy.
- Based on these results, we propose Polysulphate & products based on Polyhalite are prepared and sieved to a maximum of 200um for testing purposes.