UNITED INITIATORS
driving your success

Persulfates

For Applications in the Remediation of Soils and Groundwater
UI Product Portfolio

Persulfates – A Versatile and Efficient Active Component

Persulfates are a wide used active component for the remediation of chemically contaminated soils, particularly for the ISCO-method (in-situ chemical oxidization). Here, an aqueous solution of persulfate is selectively introduced into the affected zones in the soil to decompose present contaminations in situ.
Thus, ISCO is an optimal method for the destruction of contaminants of high local concentrations.

Originally developed in North America, ISCO also evolved to become one of the leading methods in Europe.

Persulfates yield a higher oxidative power than most other remediation agents in use. Their main decomposition product is sulfate, which can be regarded as least problematic from a toxicological point of view.
Consequently, persulfates are ideal for the treatment of a wide spectrum of chemical contaminants that can be decomposed by means of oxidization.
Examples are solvents based on aliphatic and aromatic hydrocarbons, halogenated alkanes and alkenes, low-molecular PAH, BTX, mineral oil residues, pesticides and many more.

Synergies in combination with persulfates also exist in combination with other commonly applied remediation techniques, such as based on tensides and potassium permanganate. In contrary to the latter one, application of persulfates will not lead to an increase of the heavy metal content of the soil after treatment.

United Initiators are producing all persulfate types relevant for soil remediation in the required high quality and purity.

UI's Product Portfolio for Soil Remediation

NPS (Sodium Persulfate)

- **Free of nitrogen**
  NPS from United Initiators does not contribute to an increase of the nitrogen load in the soil.
  In contrary to our competition, we are producing NPS directly from sodium sulfate and not by conversion of ammonia salts.
- **High solubility (more than 500 g/l at 20°C / 70°F)**
  Thus convenient handling and preparation of aqueous solutions.
- **High oxidization potential, facile activation**
  Effective and fast destruction of contaminants.
- **High purity (> 99 %)**

KPS (Potassium Persulfate)

- **Free of nitrogen**
  KPS from United Initiators is also produced by conversion of potassium salts without use of ammonium and does thus not contribute to an increase of the nitrogen load in soils.
- **High fineness, lower solubility in water than NPS**
  Facilitates dosing and allows preparation of aqueous slurries
- **Increases half-life after injection under ground**
  Thus suitable for use in permeable systems with controlled persulfate release.
- **High oxidizing potential, facile activation**
  Effective destruction of contaminants.
- **High purity (> 99 %)**

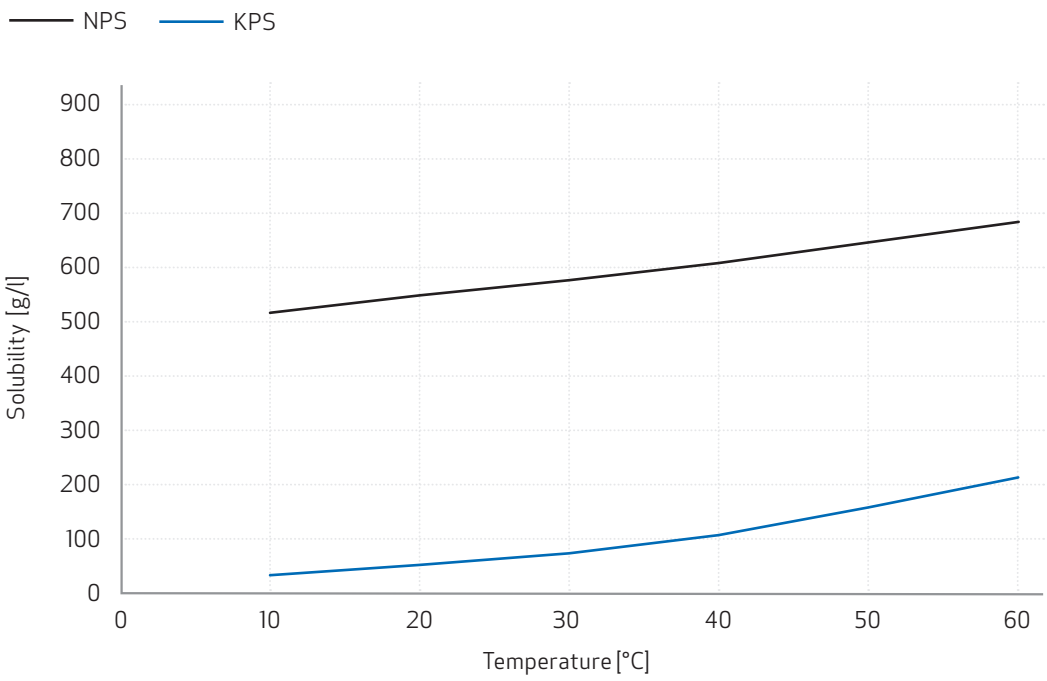
UI's PERSULFATES – TYPICAL ANALYTICAL DATA

	Unit	NPS Sodium Persulfate	KPS Potassium Persulfate	Comment [1]
Active Oxygen	%	> 6.65 / 6.70	> 5.86	S/T
Purity	%	> 99.0 / 99.9	> 99.0	S/T
Sulfuric Acid	%	< 0.1	< 0.15	S/T
Moisture	%	< 0.03	< 0.03	T
Bulk Density	g/cm³	1.25	1.10	T
Insolubles	ppm	< 10	< 20	T
pH (1% in water, 20 °C)		4.5	3.7	T
pH (10% in water, 20 °C)		3.5	-	T
Potassium (K)	ppm	< 10	-	T
Sodium (Na)	ppm	-	< 90	T
Copper (Cu)	ppm	< 0.1	< 0.1	T
Chloride (Cl)	ppm	< 3.0	< 3.0	T
Chromium (Cr)	ppm	< 0.8	< 0.8	T
Iron (Fe)	ppm	< 5 / 1	< 5 / 1	S/T
Manganese (Mn)	ppm	< 0.2	< 0.2	T
Zink (Zn)	ppm	< 2.0	< 2.0	T

[1] S = technically specified; T = typical value

SOLUBILITY OF PERSULFATES AS FUNCTION OF TEMPERATURE

(Aqueous solutions)



PARTICLE SIZE			
Sieve aperture		Passing [%]	
µm	mesh	NPS [1]	KPS [2]
2360	8	100	100
710	24	96	100
500	32	87	100
355	40	66	100
250	60	41	100
180	80	20	100
125	115	10	95
90	170	5	85

[1] Results of sieve analysis.
[2] Results of light scattering test in presence of 0.5 % silica.

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United Initiators – With more than 100 years of experience in the production of persulfates and with four manufacturing sites, we are the globally leading producer of this product class.

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