AGRO SOLVENTS

Sasol Performance Chemicals

NORTH AMERICA

About Us

Sasol Performance Chemicals develops and markets a broad portfolio of organic and inorganic commodity and specialty chemicals and comprises three key business divisions: Organics, Advanced Materials and Wax. Our offices in 18 countries serve customers around the world with a multifaceted portfolio of state-of-the-art chemical products and solutions for a wide range of applications and industries.

Surfactants, surfactant intermediates, fatty alcohols, linear alkyl benzene (LAB), short-chain linear alpha olefins, mineral oil-based and synthetic paraffin waxes, high-purity and ultra-high-purity alumina as well as high-quality carbon solutions form the basis of our key product range.

As individual as the industrial applications they serve, the tailor-made solutions offered by our products create real business value for customers. Ongoing research activities result in a continuous stream of innovative product concepts that help our customers position themselves successfully in future markets.

Our products are used in countless applications in our daily lives to add value, security and comfort. Typical examples include detergents, cleaning agents, personal care, construction, paints, inks and coatings, metalworking and lubricants, hot-melt adhesives, bitumen modification and catalyst support for automotive catalysts and refineries as well as other specialty applications including oil and gas recovery, agriculture, plastic stabilization, and polymer production. Every day, our researchers explore ways to improve our products and develop innovations that improve the quality of people's lives.

Sasol Alcohols, Alkyl Ethers and Base Oils

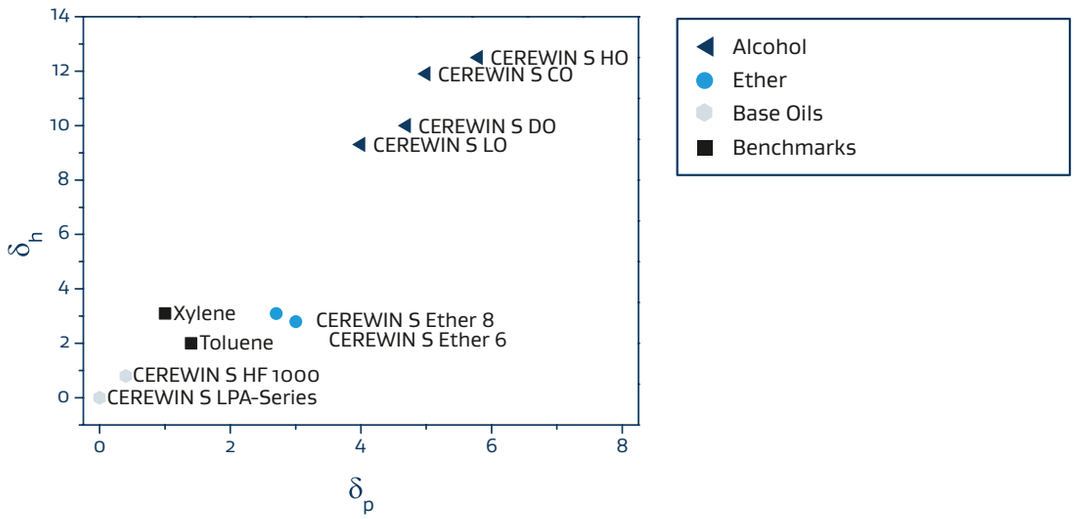

Figure 1: Hansen Solubility Parameters have been met with greatest interest in the agricultural industry to aid in the selection of solvents. To give a comprehensive overview of different solvents, a so-called Hansen plot is used where the hydrogen bonding solubility parameter $\delta_h\left[\sqrt{\frac{J}{cm^3}}\right]$ is plotted as a function of the polar solubility parameter $\delta_p\left[\sqrt{\frac{J}{cm^3}}\right]$.

Application in AG formulations

	Solvent	EC	SC	SE	EW	OD	Cosolvent	Adjuvant
CEREWIN S HO 1-Hexanol	X	X		X	X	X	X	X
CEREWIN S CO 1-Octanol	X	X		X	X	X	X	X
CEREWIN S DO 1-Decanol	X	X		X	X		X	X
CEREWIN S LO 1-Dodecanol	X	X		X	X		X	X
CEREWIN S HF 1000	X	X		X		X	X	X
CEREWIN S LPA 142	X	X		X		X	X	X
CEREWIN S LPA 170	X	X		X		X	X	X
CEREWIN S LPA 210	X	X		X		X	X	X
CEREWIN S ETHER 6	X	X		X	X		X	X
CEREWIN S ETHER 8	X	X		X	X		X	X

X = Yes **EC** = Emulsion concentrate **SC** = Suspension concentrate **SE** = Suspo emulsion **OD** = Oil dispersion
EW = CE = Concentrated emulsion in water **Adjuvant** = Maximizes the efficacy of active ingedrient

CEREWIN S HO (1-Hexanol)

CEREWIN S HO is used in combination with many actives to successfully formulate e.g. insecticides in traditional oil dispersions (OD) or more sophisticated suspoemulsions (SE). The latter combines the benefits of suspended particles (SC) and active ingredients solubilized in CEREWIN S HO as oil in water emulsion (EW) or emulsifiable concentrate (EC). CEREWIN S HO acts as a crystallization inhibitor of many actives.

Advantages

- Used in combination with many actives
- Excellent solvent for many types of formulations (EC, EW, SE and OD)
- Acts as solvent / co-solvent or adjuvant as crystallization inhibitor

CEREWIN S CO (1-Octanol) and CEREWIN S DO (1-Decanol)

CEREWIN S CO and CEREWIN S DO are standard solvents in many insecticide / miticide and fungicide formulations. When spray droplets dry on a leaf surface, CEREWIN S CO and CEREWIN S DO act in many cases as adjuvants facilitating the uptake of lipophilic active ingredients through the waxy plant leaf barriers. CEREWIN S CO and CEREWIN S DO act also as crystallization inhibitors for many actives. They find major use in tobacco sucker control agents, used to kill young suckers up to 1 and 1.5 inches (25 and 37 mm) in length.

Advantages

- Used as a standard solvent in insecticide / miticide and fungicide formulations
- Major use in tobacco sucker control agents
- Excellent solvents for many types of formulations:
- CEREWIN S CO: EC, EW, SE and OD
- CEREWIN S DO: EC, EW and SE
- Facilitates the uptake of lipophilic active ingredients through the waxy plant surface
- Acts as solvent / co-solvent or adjuvant as crystallization inhibitor

CEREWIN S LO (1-Dodecanol)

CEREWIN S LO is used as an adjuvant and co-solvent in many insecticide and fungicide formulations. It is mainly used to improve the spreading and penetration properties, thereby improving the efficacy of the active ingredient.

Advantages

- Used as an adjuvant and co-solvent in insecticide and fungicide formulations
- Improves spreading and penetration properties
- Optimizes efficacy of the active ingredient
- Excellent solvent for many types of formulations (EC, SE and EW)

CEREWIN S HF 1000

Sasol's CEREWIN S HF 1000 is a synthetic high-performance alternative to highly refined mineral oils and aromatic solvents. CEREWIN S HF 1000 is a value–added alternative agricultural applications because of its low acute aquatic toxicity, rapid biodegradation and the absence of polynuclear aromatics. CEREWIN S HF 1000 is BTEX-free (the acronym BTEX stands for mixtures of benzene, toluene, ethylbenzene, and the three xylene isomers). CEREWIN S HF 1000 is a blend of paraffins, olefins and oxygenates which combine to make a low viscosity, pale-yellow liquid with a flash point of > 81 °C (178 °F).

Advantages

- Synthetic, contains isoparaffins, olefins, paraffins, esters and alcohols
- Excellent solvent for many types of formulations (EC, SE and OD)
- Outstanding lubricating properties
- Readily biodegradable and low acute aquatic toxicity
- High flash point > 81 °C (178 °F)
- No aromatics (BTEX-free)

CEREWIN S LPA Series

Sasol produces a series of linear paraffinic solvent cuts: CEREWIN S LPA 142, CEREWIN S LPA 170 and CEREWIN S LPA 210, which differ in flash point. CEREWIN S LPA 170 is a high purity mixture of hydrotreated isoparaffins and naphthenics with very low levels of polynuclear aromatics. The CEREWIN S LPA series is BTEX-free (the acronym BTEX stands for mixtures of benzene, toluene, ethylbenzene, and the three xylene isomers). CEREWIN S LPA 170 is a clear liquid with mild odor and typically used as carrier for insecticides. The viscosity profile of CEREWIN S LPA 170 is ideal for spray applications: e.g. in anti-fly spray for cattle. The unique process used to manufacture this solvent produces low levels of n-paraffins.

Advantages

- Readily biodegradable
- Low aromatic aliphatic solvent (BTEX-free)
- Low VOC
- Alternative to mineral oils
- Outstanding wetting properties
- Ideal for insecticide sprays
- Excellent solvent for many types of formulations (EC, SE and OD)

CEREWIN S ETHERS

CEREWIN S Ethers are biodegradable dialkyl ethers with high purity. This fast-spreading solvents are alternatives to mineral oils and other commonly used solvents as, e.g. toluene or xylene. CEREWIN S ETHERS dry completely without residue and possess a high flash point and low pour point. CEREWIN S ETHER 6 and CEREWIN S ETHER 8 are excellent solvents for greasy residues.

Advantages

- Excellent solubility of greasy residues
- Feedstock back-integrated ethers based on linear alcohols (C6 and C8)
- High purity
- Excellent flow and low viscosity properties
- Fast-spreading agents
- Higher polarity than paraffins
- Alternative to many silicone additives
- Good wetting properties
- pH stable
- low VOC

Physical Properties of CEREWIN S-Types

Physical Properties	Average Mw (g/mol)	Density (g/mL)	Flash Point (°C / °F)		Viscosity mPa s	Boiling Point (°C / °F)	
CEREWIN S HO	102	0.800	61	142	6.20	150-170	302-338
CEREWIN S CO	130	0.800	82	180	10.5	185-200	365-392
CEREWIN S DO	158	0.800	114	237	16.3	220-235	428-455
CEREWIN S LO	186	0.820	119	246	21.0	258-265	496-509
CEREWIN S HF 1000	215	0.799	≥ 81	≥ 178	3.23	218	424
CEREWIN S LPA 142	156	0.804	62-67	144-153	1.80	192-211	376-412
CEREWIN S LPA 170	172	0.810	69	156	2.40	213-232	415-450
CEREWIN S LPA 210	193	0.826	78-81	172-178	4.10	239-276	464-528
CEREWIN S ETHER 6	186	0.789	97	207	2.10	211	412
CEREWIN S ETHER 8	240	0.807	141	286	3.60	> 207	> 405

Current listing status of CEREWIN S-Types

Product	Reach status	EPA Inert status
CEREWIN S HO 1-Hexanol	Produced in Europe, re-import exemption	Upon request
CEREWIN S CO 1-Octanol	Produced in Europe, re-import exemption	Upon request
CEREWIN S DO 1-Decanol	Produced in Europe, re-import exemption	Upon request
CEREWIN S LO 1-Dodecanol	Produced in Europe, re-import exemption	Upon request
CEREWIN S HF 1000	*	Upon request
CEREWIN S LPA 142	Not yet registered by a European Sasol Legal Entity	Upon request
CEREWIN S LPA 170	**	Upon request
CEREWIN S LPA 210	Not yet registered by a European Sasol Legal Entity	Upon request
CEREWIN S ETHER 6	Produced in Europe, re-import exemption	Upon request
CEREWIN S ETHER 8	Produced in Europe, re-import exemption	Upon request

*Only Sasol Germany would be able to import into Europe. US customers could not ship to European customers, unless their EU customers have registered on their own.

**Only Sasol Italy would be able to import into Europe. US customers could not ship to European customers, unless their EU customers have registered on their own.

SASOL Glycol Ethers and Esters

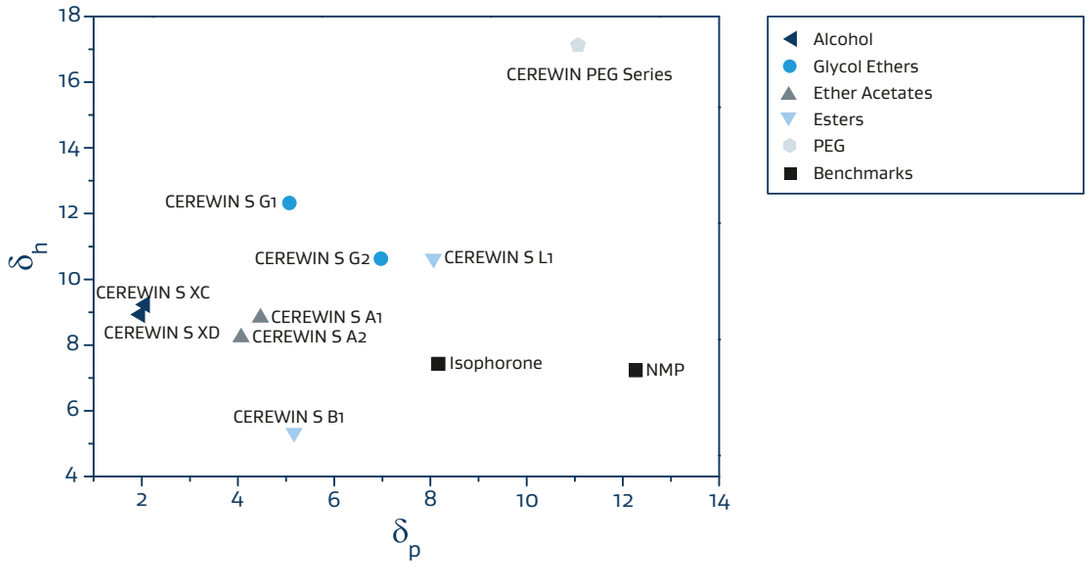

Figure 2: Hansen Solubility Parameters have been met with greatest interest in the agricultural industry to aid in the selection of solvents. To give a comprehensive overview of different solvents, a so-called Hansen plot is used where the hydrogen bonding solubility $\delta_h\left[\sqrt{\frac{J}{cm^3}}\right]$ parameter is plotted as a function of the polar solubility parameter $\delta_p\left[\sqrt{\frac{J}{cm^3}}\right]$

Application in AG formulations

	Solvent	EC	SC	SE	EW	OD	Cosolvent	Adjuvant
CEREWIN S L1	X	X		X		X	X	X
CEREWIN S B1	X	X		X	!		X	X
CEREWIN S G1	X	X		!	X		X	X
CEREWIN S G2	X	X		!	X		X	X
CEREWIN S A1	X	X		!	X		X	X
CEREWIN S A2	X	X		X	X		X	X
CEREWIN S PEG 200	X		X	X	X	X	X	X
CEREWIN S PEG 400	X		X	X	X	X	X	X

X = Yes **!** = maybe **EC** = Emulsion concentrate **SC** = Suspension concentrate **SE** = Suspo emulsion **OD** = Oil dispersion
EW = CE = Concentrated emulsion in water **Adjuvant** = Maximizes the efficacy of active ingedrient

CEREWIN S solubility in wt% at 20°C

Solvency	Fungicide Propiconazole	Herbicide Pendimethalin
CEREWIN S L1	> 60 %	-
CEREWIN S B1	> 60 %	> 40 %
CEREWIN S G2	> 80 %	-
CEREWIN S A2	> 80 %	> 40 %
CEREWIN S HO	> 80 %	-
CEREWIN S LO	> 70 %	-

CEREWIN S L1

CEREWIN S L1 is the lactic ester of mono-branched primary fatty alcohol CEREWIN S XC. This lactic ester is a value-added alternative to agrochemical formulations because of its good wetting behavior and enhanced solvency of many actives. This ester exhibits some unique characteristics of lactic acid derivatives being a good solvent for mixtures of water soluble and water insoluble active ingredients. It demonstrates excellent wetting properties on different types of leaves, from dry to waxy.

Advantages

- Feedstock back-integrated esters based on mono-branched alcohols (C12 - C13)
- Use of bio-based lactic acid
- Excellent flow and low viscosity properties
- Fast spreading agents
- Good wetting properties
- Excellent solubility

CEREWIN S B1

CEREWIN S B1 is the benzoic ester of mixed linear and mono-branched primary fatty alcohol CEREWIN S XD. This synthetic benzoic ester is a value-added alternative for agrochemical formulations because of its good wetting behavior and enhanced solvency of many actives.

Advantages

- Feedstock back-integrated esters based on mixed linear and mono-branched alcohols (C12 - C15)
- Synthetic benzoic ester
- Excellent flow and low viscosity properties
- Fast-spreading agents
- Good wetting properties

CEREWIN S G1

CEREWIN S G1 is a widely used solvent. It is a feedstock back-integrated glycol ether and ideal for use as a co-solvent due to its high solvency power. CEREWIN S G1 reduces the viscosity and acts as a property regulator, coalescence and flow improver in water-based dispersions. Other applications include mineral oil emulsions, where CEREWIN S G1 is used as a solubilizer. CEREWIN S G1 has outstanding solvent power for many active ingredients.

Advantages

- High solvency power
- Feedstock back-integrated ether based on n-butanol
- Acts as viscosity and property regulator
- Coalescence and flow improver in water-based suspensions
- Solubilizer for mineral oil emulsions

CEREWIN S G2

CEREWIN S G1 is a widely used solvent. It is a feedstock back-integrated glycol ether and ideal for use as a co-solvent due to its high solvency power. CEREWIN S G2 acts as a stabilizer and is used as a deactivator for formulations used before crop emerges from soil.

Advantages

- Feedstock back-integrated ether based on n-butanol.
- Excellent solvent power
- Stabilizer
- Ideal co-solvent
- Used as deactivator for formulations used before crop emerges from soil

CEREWIN S A1

CEREWIN S A1 is a widely used solvent. It is a feedstock back-integrated ether acetate and ideal for use as a co-solvent due to its high solvency power.

Advantages

- Feedstock back-integrated ether acetate based on n-butanol.
- Excellent solvent power
- Ideal co-solvent

CEREWIN S A2

CEREWIN S A2 is used as a high-boiling solvent, levelling agent (helps fixing molecules uniformly to a surface) and coalescent. It is a feedstock back-integrated ether acetate and ideal for use as a co-solvent due to its high solvency power.

Advantages

- Feedstock back-integrated ether acetate based on n-butanol.
- High boiling solvent
- Excellent solvent power
- Ideal co-solvent

CEREWIN PEG Series

The excellent solvent properties and viscosity reducing effects of CEREWIN S PEG 200 are important in cosmetics, pharmaceutical preparations, paints, lacquers, liquid household products and agrochemical formulations. CEREWIN S PEG 200 is especially used in situations where a good water solubility important.

Advantages

- Feedstock back-integrated polyethylene glycol.
- High boiling solvent
- Excellent solvent power
- Ideal co-solvent
- Viscosity reducing effects

Physical properties of CEREWIN S-Types

	Average Mw	Density	Flash point		Viscosity	Boiling point	
	g/mol	g/mL	°C	°F	mPas	°C	°F
CEREWIN S L1	258	0.921	156	313	22.4	300-345	572-653
CEREWIN S B1	290	0.930	190	374	15.3	196	385
CEREWIN S G1	118	0.900	67	153	3.3	168-172	334-342
CEREWIN S G2	162	0.950	115	239	6.0	228-233	442-451
CEREWIN S A1	160	0.940	78	172	1.8	192	378
CEREWIN S A2	204	0.980	102	216	3.5	245	473
CEREWIN S PEG 200	190-210	1.124	180	356	60-70	> 250	> 482
CEREWIN S PEG 400	380-420	1.126	240	464	105-130	> 250	> 482

Current listing status of CEREWIN S-Types

Product	Reach status	EPA Inert status
CEREWIN S L1	Produced in Europe, re-import exemption	Upon request
CEREWIN S B1	Produced in Europe, re-import exemption	Upon request
CEREWIN S G1	Produced in Europe, re-import exemption	Upon request
CEREWIN S G2	Produced in Europe, re-import exemption	Upon request
CEREWIN S A1	Produced in Europe, re-import exemption	Upon request
CEREWIN S A2	Produced in Europe, re-import exemption	Upon request
CEREWIN S PEG 200	Polymer*	Upon request
CEREWIN S PEG 400	Polymer*	Upon request

*All monomers, starting molecules and further reactants of this polymer have been registered according to Regulation (EC) No. 1907/2006 (REACH) and fall under the re-import exemption.

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