KRATON™

RENEWABLE FOUNDATIONS **FOR UNLIMITED PERFORMANCE**

Oleochemical and Rosin Product Guide

Leading Global Producer of Pine Chemistry

Kraton develops, manufactures and markets biobased chemicals and specialty polymers that deliver exceptional value and enhance the lives of people all over the world.

Our biobased chemistry portfolio delivers sustainable value, helping numerous industries replace non-renewable sources with environmentally-friendly alternatives offering unmatched performance. With more than 80 years of experience making pine-based raw materials and the largest manufacturing capacity worldwide, our specialty chemicals help improve the quality of thousands of everyday products through safer, better chemistry. Our manufacturing facility in Sandarne, Sweden was one of the pioneers in developing a process for refining tall oil into biobased chemicals. In fact, the term "tall" originated from the Swedish term for pine trees.

High-Quality, Excellent Consistency

Kraton is the world's largest producer of pine chemicals and specialty resins based on crude tall oil (CTO), a byproduct of pine wood pulping. This feedstock and our primary bio-refinery products – SYLFAT™ tall oil fatty acids (TOFA), SYLVAROS™ tall oil rosin (TOR) and SYLVATAL™ distilled tall oil (DTO) – are biobased, natural, non-edible and have an overall lower carbon footprint compared to vegetable alternatives.

CTO is derived from pine trees, so it is not as sensitive to seasonal changes compared to other plant-derived alternatives. This, in combination with our world-class bio-refineries, enable our products to have excellent composition consistency and constant high quality.

High Supply Security

Kraton's global, well-established network of bio-refineries enables us to provide high supply security of products. In combination with our bio-derived raw material, our products deliver excellent composition consistency and constant high quality.

Sustainable Solutions

Our product's low carbon footprint and high biobased content can help advance customers' sustainability goals. In 2016, Kraton became the first company to receive the European biobased certification for our SYLFAT tall oil fatty acid product range – a key differentiator in the biobased product market. The certification system is based on the European standard EN 16785-1, which requires independent assessment of claims on the biobased content of products.

biobased %

PINE CHEMICAL'S CARBON FOOTPRINT LOWER THAN SUBSTITUTES

Pine chemicals have been proven to have a lower footprint than their substitutes. On a global scale, pine chemicals cause carbon emissions that are

50% less

than when using a substitute.

Source: Life cycle analysis undertaken by Franklin Associates, a Division of Eastern Research Group, and sponsored by the American Chemistry Council's Pine Chemistry Panel

Pine chemicals footprint
Pine chemicals substitutes*

*** Pine chemicals substitutes = weighted average**

Broad Product Application

You can find SYLFAT™, SYLVAROS™, SYLVATAL™ and UNIDYME™ pine chemicals in applications such as:

- Alkyd Resins
- Metalworking Fluids
- Asphalt Emulsions
- Epoxy Ester Resins
- Ester Solvents
- Fuel Additives
- Lubricant Additives
- Rust Inhibitors
- Anti-wear Agents
- Friction Modifiers
- Plasticizers for Rubber
- Mineral Processing
- Special Industrial and Household Cleaners
- Oilfield Chemicals
- Textiles
- Construction
- Coatings Surfactants
- Paper Sizing

Fatty Acids

SYLFAT™ and CENTURY™ fatty acids are useful in a wide range of industrial applications. The utility of these product ranges can be found in the long carbon chain (C_{18}), acid function of the carboxyl group (COOH) and unsaturation of the double bonds. Each of the SYLFAT and CENTURY fatty acids have a unique degree of unsaturation and fatty acid distribution, which is related to the region of origin.

All SYLFAT tall oil fatty acids (TOFA) have a high fatty acid content, a low content of rosin acids and unsaponifiables. SYLFAT 2 and SYLFAT 2LT are from European, particularly Scandinavian, origin and have a specific characteristic to have more double bounds (e.g. higher Iodine Value) compared to TOFA with an origin closer to the equator, such as SYLFAT FA1 and SYLFAT FA2. SYLFAT 2 and SYLFAT FA2 provide a combination of light color, good color stability and air-drying properties. SYLFAT 2LT is a specialty grade of TOFA with excellent low temperature properties typically used as fuel additive to improve lubricity of low sulphur diesel.

CENTURY Pine-based, Branched Fatty Acids offer a unique mixture of branched and straight-chain saturated/unsaturated C18 fatty acids and differ in unsaturation level and viscosity.

CENTURY D1 and CENTURY M05 contain both saturated and unsaturated C18 fatty acids, with branched chain iso-oleic acids constituting the main portion, and with virtually no polyunsaturated fatty acids.

Product	Product Description	Region of Origin	Color Gardner	Biobased Content**, %	Acid Value mg KOH/g	Viscosity mPa.s at 20 °C	Free Rosin Acids %	Unsaps %	Iodine Value cg I/g	Pour Point °C	Cloud Point °C
SYLFAT 2	TOFA	Europe	4	100	196	25	1.6	2	152	-14	2
SYLFAT 2LT	TOFA	Europe	4	100	197	25	1.7	1	154	-15	-10
SYLFAT FA1	TOFA	USA	5	100	194	36	2.5	2	125	3	6
SYLFAT FA2	TOFA	USA	3	100	196	33	0.8	1	125	1	1
CENTURY D1	Branched Fatty Acid	USA	3	Not Rated Yet	174	Solid	NA	7	75		
CENTURY M05	Branched Fatty Acid	USA	3	Not Rated Yet	174	Semi- solid	NA	7	80		

*Typical results- actual product specifications can be obtained from Product Data Sheets
** According European standard EN 16785-1:2015 Corresponding certificates available on request.
NA = Not Applicable

Distilled Tall Oil

The SYLVATAL™ products are distilled tall oils (DTO) containing 10–40 percent rosin acids. SYLVATAL products combine the advantages of fatty acids and rosin acids, and therefore, an ideal raw material for functional products like metalworking fluids, oil field chemicals, soaps, cleaners and alkyd resins. SYLVATAL grades help to provide hardness improvement for indoor varnishes with high gloss and excellent water and alkali resistance. When used as magnesium soaps, SYLVATAL products can be efficient dispersants for fuel oils.

SYLVATAL 10S, SYLVATAL 20S, SYLVATAL 20/25S and SYLVATAL 25/30S grades are from European, particularly Scandinavian, origin and have a specific characteristic to have more double bounds (i.e. higher Iodine Value) compared to DTO with an origin closer to the equator, such as SYLVATAL D25LR, SYLVATAL D30LR and D40LR products.

Product	Product Description	Region of Origin	Biobased Content**, %	Color Gardner	Acid Value mg KOH/g	Viscosity mPa.s at 20°C	Free Rosin Acids %	Unsaps %
SYLVATAL 10S	DTO	Europe	100	5	194	40	10	1
SYLVATAL 20S	DTO	Europe	100	5	192	60	20	2
SYLVATAL 20/25S	DTO	Europe	100	5	190	80	22	2
SYLVATAL D25LR	DTO	USA	100	5	189	120	25	4
SYLVATAL 25/30S	DTO	Europe	100	5	189	110	27	2
SYLVATAL D30LR	DTO	USA	100	5	188	170	30	4
SYLVATAL D40LR	DTO	USA	100	5	178	400	39	4

*Typical results- actual product specifications can be obtained from Product Data Sheets

** According European standard EN 16785-1:2015 Corresponding certificates available on request

Polymerized Fatty Acids

UNIDYME™ products are dimerized fatty acids specially designed for the manufacture of polyamide curing agents, other high molecular weight intermediates and certain specialty additive applications. Based on the same feedstocks as our SYLFAT fatty acids, UNIDYME products are also characterized by a high composition consistency and constant high quality.

Product	Product Description	Region of Origin	Biobased Content**, %	Color Gardner	Acid Value mg KOH/g	Viscosity mPa.s at 20°C	Dimer Acid %	Monomer Acids %	Trimer Acids %	Unsaps %
UNIDYME 14	Distilled Dimer Acid	USA	100	4	194	7250	95	0.2	5	0.2
UNIDYME 18	Dimer Acid	USA	100	6	192	8500	82	1.5	17	0.2
UNIDYME 22	Dimer Acid	USA	100	7	192	8700	81	2.0	17	0.1
UNIDYME 35	Dimer Acid	USA	100	9	192	9400	81	1.6	17	0.1
UNIDYME 60	Trimer Acid	USA	Not Rated Yet	12	180	37200	41	0.7	59	0.1

*Typical results- actual product specifications can be obtained from Product Data Sheets
** According European standard EN 16785-1:2015 Corresponding certificates available on request

Tall Oil Rosins and Soaps

Tall oil rosin (TOR) is a primary bio-refinery product based on crude tall oil (CTO) and comparable to the resinous constituent found in pine tree exudates.

SYLVAROS™ GRS and NCY products are an unmodified TOR with a high content of abietic type rosin acids. It is especially suited for the manufacture of fortified rosin, paper size and ink resins.

SYLVAROS Rosin and Disproportionated Rosins (DR) can be used for the manufacture of emulsifiers for the polymerization process and pigment coating. DR grades are further suitable for the formulation of solvent- based and hot-melt adhesives as well as in the manufacture of adhesive tapes and rubber products. Other applications are lacquers, soldering fluxes, sealants, paper sizing agents, marine coatings and the production of rosin derivatives.

SYLVAROS Rosin Soaps (RS) and Disproportionated Rosin Soaps (DRS) are used as emulsifiers in the polymerization process of styrene-butadiene rubber, nitrile rubber, polychloroprene and acrylonitrile-butadiene-styrene plastics. It is also suitable for the preparation of pigments, as anchoring agent and in the adhesive industry to improve adhesive properties on basis of casein or polymer dispersions.

Product	Product Description	Region of Origin	Biobased Content**, %	Color Gardner	Acid Value mg KOH/g	Abietic Acid %	Dehydroabietic Acids %	Unsaps %	Solid Content %	Rosin Content %
SYLVAROS GRS	TOR	USA	100	7	162	26	21	7	100	82
SYLVAROS NCY	TOR	USA	100	7	166	3.6	17	5	100	85
SYLVAROS DR 22 NC	TOR	USA	Not Rated Yet	5	159	0.4	55	7	100	87
SYLVAROS DRS 214	K-Rosin Soap	Europe	Not Rated Yet	7	11	0	42	9	80	
SYLVAROS DRS 215	K-Rosin Soap	Europe	Not Rated Yet	7	10	0.1	43	9	84	
SYLVAROS DRS 40	K-Rosin Soap	USA	Not Rated Yet	4	16	0.4	42	8	80	
SYLVAROS DRS 42	K-Rosin Soap	USA	Not Rated Yet	8	12	0.4	41	8	80	
SYLVAROS RS 200	K-Rosin Soap	Europe	Not Rated Yet	6	10	25	8	3	55	

*Typical results- actual product specifications can be obtained from Product Data Sheets
** According European standard EN 16785-1:2015 Corresponding certificates available on request.

Potential Applications

SYLFAT™, CENTURY™, SYLVATAL™, SYLVAROS™ and UNIDYME™ pine chemicals are used for their functional properties, such as chemical reactivity and surface activity in chemical synthesis or in formulated products. For instance, the functionality of the carboxylic group of the fatty acids can be used to react with amines to form new amines, amides and imidazolines. This same functional group is readily reacted with mono-, di-, and poly alcohols to form esters offering unique properties. The unsaturation sites in the carbon chain's backbone can be used in Diels-Alder reactions to make adducted products. Dimer acids can be produced from TOFA, either thermally or catalytically.

	SYLFAT	SYLVATAL	CENTURY D1, M05	UNIDYME	SYLVAROS GRS, NCY	SYLVAROS DR 22 NC	UNI-REZ 25xx
	TOFA	DTO	Branched Fatty Acid	Dimer	Tall Oil Rosin	Dispro.Rosin	Thixo Polyamide
Asphalt Emulsions	■	□					
Construction							
Concrete Release Agents	■	■	□				
Concrete Air Entrainment	■	■					
Ester Solvents	■	□	■				
Fuel Additives	■	□		■			
Lubricants							
Lubricant Esters / Base Oils	■	□	■	■			
Lubricants Additives	■						
Metalworking Fluids	■	■					
Mineral Processing	■	■	■				
Oilfield Chemicals	■	■	■	■			
Plasticizers For Rubber	■		□				
Resins							
Alkyds, Short Oil		■	■		□		
Alkyds, Medium/Long Oil	■	■			□		■
Antifouling Coatings				■	□	■	
Phenolic / Resinate Ink Resins							
Epoxy Esters	■			■			
Pigment Wetting Agents	■	■				■	
Polyamide Curing Agents	■			■			
UV Curing Resins				■			
Special Industrial and Household Cleaners	■	■					
Textiles	■	■	□				

■ Recommended □ Functional

KRATON™

ABOUT KRATON CORPORATION

Kraton Corporation (NYSE: KRA) is a leading global producer of styrenic block copolymers, specialty polymers and high-value performance products derived from pine wood pulping co-products. Kraton's polymers are used in a wide range of applications, including adhesives, coatings, consumer and personal care products, sealants and lubricants, and medical, packaging, automotive, paving and roofing applications. As the largest global provider in the pine chemicals industry, the company's pine-based specialty products are sold into adhesive, road and construction and tire markets, and it produces and sells a broad range of performance chemicals into markets that include fuel additives, oilfield chemicals, coatings, metalworking fluids and lubricants, inks and mining. Kraton offers its products to a diverse customer base in numerous countries worldwide.

Kraton Corporation (NYSE:KRA)

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