



MERCK

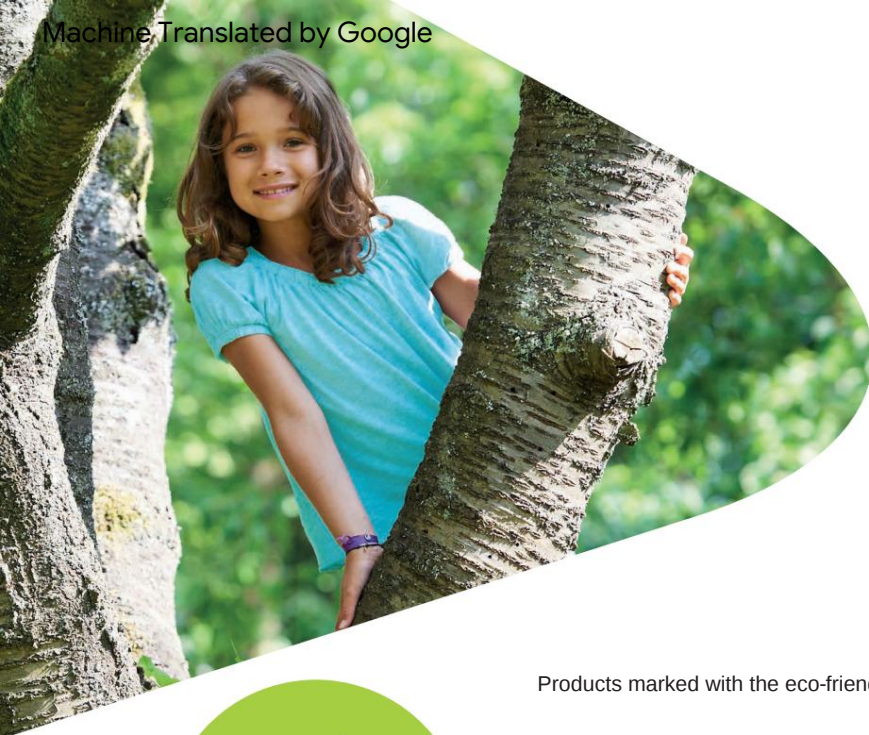
Chemistry for Green

“Sustainable future starts with sustainable chemistry research”



The life science
business of Merck
operates as
MilliporeSigma in
the U.S. and Canada.

Sigma-Aldrich®
Lab & Production Materials



Merck manufactures products to help you conduct research and analyzes that improve people's lives. However, we recognize that everything we manufacture also has an impact on the environment.

We are therefore committed to continuously enhancing the sustainability of our products and using environmentally friendly chemical processes. In addition, we strive to make our customers safer in their daily work with our products, including by offering less toxic alternatives.



Products marked with the eco-friendly alternative icon (left) meet one of the following four criteria:

1. Reengineered (redesigned) products: Significantly improve environmental impact.
2. 12 Principles Compliant Products: Compliant with the 12 Principles of Green Chemistry.
3. Enabling Products: Enabling environmentally friendly alternatives.
4. Design for Sustainability (DfS) Developed Products: Demonstrate important sustainability characteristics.

12 principles of green chemistry

In 1998, Paul Anastas and John Warner proposed a framework for changing the way scientists think about their own work, with environmentally friendly chemical processes and products in mind. Those 12 principles are represented by the icons below. These are a quick reference for greener alternatives and biorenewable solvent classifications.



Use of renewable raw materials



Safer solvents and auxiliaries



Degradable design



waste prevention



safer chemicals design



Intrinsically Safer
Chemicals for
Accident Prevention



DESIGNED FOR
ENERGY EFFICIENCY



reduction of capacity



Catalyst



atom economy
(atomic efficiency)



Reduced synthesis of hazardous
chemical substances



REAL-TIME ANALYSIS FOR
POLLUTION PREVENTION

You can find out more about our commitment to sustainability on our website. <https://www.sigmaaldrich.com/JP/ja/life-science/ssbi/sustainable-operations>



Solvents derived from biological materials and biodegradable surfactants

BioRenewable solvent

BioRenewable solvents are bio-based to reduce consumption of non-renewable resources. is produced from the raw materials of Many contaminants present in petroleum-based products , and can be used as a drop-in replacement.

Cyrene

NMP (N-methyl-2-pyrrolidone), DMF (N,N-dimethylformamide),
Alternative solvent to sulfolane

<Features and Benefits>

Cyrene is an alternative to common REACH regulated solvents such as NMP.

A new dipolar aprotic solvent. environmentally friendly

one of the worst solvents, manufactured from renewable raw materials,

Breaks down into CO₂ and H₂O. In addition, mutagenicity and genetic

It is safe to handle and has no toxicity concerns.

DMF is used in cross-coupling reactions, peptide synthesis, etc.

It may be an alternative.

Cyrene is
eco alternatives and
can it be?



Product number	Product name	CAS number
807796	Cyrene, BioRenewable	53716-82-8

Cyrene blend solvent

Aprotic solvents such as NMP and DMF have many regulatory, health and environmental concerns, yet maintain high reaction yields

There were few alternatives. Cyrene can be difficult to use in reactions where solvent viscosity can be an issue.

I will. The Cyrene blend solvent brings the viscosity of Cyrene closer to that of NMP and DMF, adjusting it to a lower viscosity and allowing it to be used in existing reaction setups. and more compatible with conditions.

Product number	Product name
920193	Cyrene 2-Methyltetrahydrofuran Blend, BioRenewable
920207	Cyrene γ-Valerolactone Blend, BioRenewable

Other BioRenewable Products

Product number	Product name	CAS number
673277	2-Methyltetrahydrofuran, BioRenewable, anhydrous, >=99%, Inhibitor-free	
414247	2-Methyltetrahydrofuran, BioRenewable, anhydrous, >=99.0%, contains 250 ppm BHT as stabilizer	96-47-9
155810	2-Methyltetrahydrofuran, BioRenewable, ReagentPlus™, >=99.5%, contains 150-400 ppm BHT as stabilizer	
909955	2-Propanol, BioRenewable, ReagentPlus™, >=99.5%	67-63-0
918660	γ-Valerolactones, BioRenewable, >=99%, ReagentPlus™	108-29-2
904082	Acetone, BioRenewable, ACS reagent, >=99.5%	67-64-1
906832	Dimethyl isosorbide, BioRenewable, ReagentPlus™, >=99%	5306-85-4
911046	Glycerol, BioRenewable, >=99.5%	
911038	Glycerol, BioRenewable, ACS reagent, >=99.5%	56-81-5



General solvents derived from other biological materials

One of the initiatives Merck is actively pursuing is synthetic chemicals to renewable raw materials. Toxic and environmental concerns as much as possible. Prioritize chemicals that maintain functional efficacy while reducing impact.

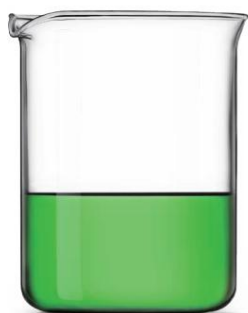
Product number	Product name	CAS number
bio-based ethanol		
1.00983	Ethanol absolute for analysis EMSURE®	
1.07017	Ethanol absolute for analysis EMPARTA®	64-17-5
1.59010	Ethanol 96% EMSURE®	
Ethyl (-)-L-lactic acid		
1.09639	EMPLURA® Ethyl(-)-L-Lactate	687-47-8
bio-based glycerol		
1.04057	Glycerol (vegetable origin) for analysis EMSURE® 56-81-5	
2- Methyltetrahydrofuran (methyl THF)		
1.08292	2-Methyltetrahydrofuran EMPLURA®	96-47-9



Click here for details

<https://bit.ly/3qvbmls>

biodegradable surfactant



Environments for different applications to reduce the environmental impact in research and production

We provide surfactants that are gentle on

ECO series surfactants are

Environmentally friendly product. These ECO surfactants are made from biomass ethanol.

It is renewable because it uses bio-based ethylene oxide (EO) that is naturally produced.

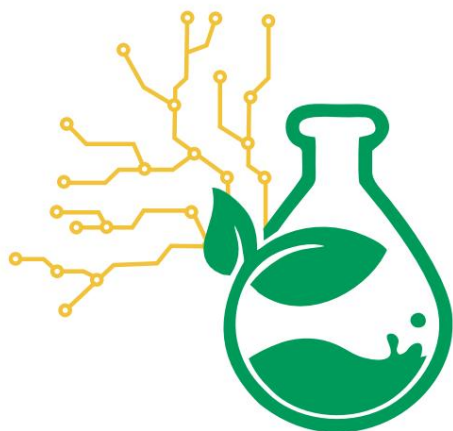
Product number	Product name	CAS number
100% Renewable Plant Based Surfactants		
STS0200	ECO TWEEN 20 viscous liquid	9005-64-5
STS0201	ECO TWEEN 40 viscous liquid	9005-66-7
STS0202	ECO TWEEN 60 non-ionic detergent	9005-67-8
STS0203	ECO TWEEN 65	9005-71-4
STS0204	ECO TWEEN 80 viscous liquid	9005-65-6
STS0205	ECO TWEEN 85	9005-70-3

Product number	Product name	CAS number
100% Renewable Plant Based Surfactants		
STS0210	ECO Brij C10	9004-95-9
STS0211	ECO Brij L23	9002-92-0
STS0212	ECO Brij L4	
STS0213	ECO Brij O10	9004-98-2
STS0214	ECO BRIJ O20	
STS0215	ECO Brij S10	
STS0216	ECO Brij S 100	9005-00-9
STS0218	ECO Brij S20	

Other biodegradable surfactants:



A green alternative to essential solvents in the electronics industry: ElectroGreen®



ElectroGreen® is a renewable resource-derived biotechnology alternative to petroleum-based synthetic compounds.

Safe alternative solvent for base (from beet/corn), electronics and energy

It is a product with specifications suitable for lugi applications. Environmentally friendly with a focus on sustainability

Gentle and reliable alternative solvent series.

Petroleum-based solvents are used in agriculture, pesticides, coatings, paints, solvents, cleaning, etc.

If so, ElectroGreen® could be an alternative.

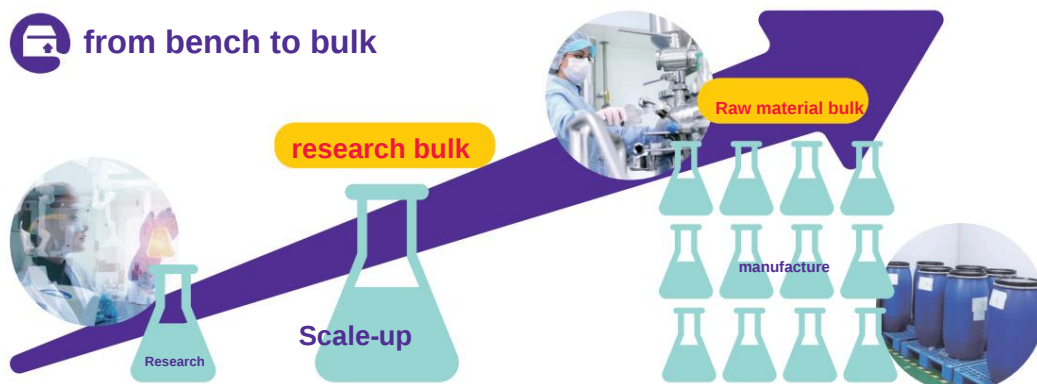
- High purity (GC)
 - Low metal content (ICP)
 - Low acidity
 - Low water content (KF)
 - Low toxicity/low VOC/low odor
 - Reduction of carbon dioxide emissions
- A bio-based alternative
- Low residue on evaporation (RESE)

Product number	Product name	Relative Evaporation Rate	Hansen Dispersion	Solubility Polar	H Bonding Parameter
929670	ElectroGreen®, Acetone substitute for electronics, bio-sourced	2.84	7.7	3.4	6.1
929697	ElectroGreen®, Butyl Cellosolve substitute for electronics, bio-sourced	0.11	7.5	3.8	6.1
929735	ElectroGreen®, Cyclohexanone substitute for electronics, bio-sourced	0.25	7.7	3.5	6.4
929654	ElectroGreen®, Isopropyl Alcohol substitute for electronics, bio-based	1.24	7.7	4.2	8.8
929727	ElectroGreen®, Methyl Amyl Ketone substitute for electronics, bio-sourced	0.247	7.7	3.4	6.7
929719	ElectroGreen®, NMP substitute for electronics - type 1, bio-sourced	<0.05	8.8	5.9	3.7
929662	ElectroGreen®, NMP substitute for electronics - type 2, bio-sourced	<0.02	9	6.8	4.6
929689	ElectroGreen®, Toluene substitute for electronics, bio-sourced	2.57	7.7	2.8	6
929700	ElectroGreen®, Xylene substitute for electronics, bio-sourced	0.89	7.7	3.1	5.8

Did you know? Sigma-Aldrich reagents are available in bulk.



from bench to bulk



bulk inquiry
web

Approximately 250,000 items similar to those listed in the catalog for research reagents are available in capacities and quality that meet needs

We will deliver

- Stable supply through a robust global supply chain network

Bulk consultation is possible from 20 times the maximum capacity listed in the catalog (excluding some products)

- Various documents (CoA, ISO, etc.) can be provided according to your own quality control program.

Products for sustainable chemical research

SYNTHIA® Retrosynthetic Analysis Software

The challenge in designing a synthetic route to reach the target compound is to find a truly practical synthetic route from among the many possibilities based on the vast number of past reports and our own knowledge. I guess.

Synthia® quickly proposes synthetic routes for known and novel compounds under specified conditions. As a result, less reagent is wasted, reducing costs and reducing waste.

Three modules to support parsing



Automatic Retrosynthesis A module for automated computer-assisted retrosynthesis analysis. The cost, the number of steps, the presence or absence of protecting groups, and other conditions specified by the user are taken into account to guide the retrosynthetic route to the commercially available substrate.



Manual Retrosynthesis Manually design a retrosynthetic route. Goals Design each step of the retrosynthesis from compound to starting material with a view of all possible reactions.



Known Network of Organic Chemistry (NOC) Literature database of over 10 million substrates and related reactions. Based on the manufacturing cost, the number of steps, and the number of substrates reported in the literature, we quickly propose the optimal synthetic route.

To **Synthia** details



Coolade: a designer surfactant tailored to enable organic synthesis in water

Several reduction reactions in organic synthesis are performed under aqueous micellar catalytic conditions (in water at ambient temperature) and form a significant amount of foam from surfactants and gas evolution. Surfactant Coolade can minimize foaming due to its low foaming properties.

Product number	Product name	CAS number
907014	Coolade	2306441-11-0
909793	Coolade solution, 2 wt. % in H ₂ O	

FastWoRX: A Faster, Greener Alternative to Liquid-Liquid Extraction

The glass powder is coated with silicon elastomer, and only organic substances are adsorbed. After the reaction, FastWoRX is added to the solution quenched with water, and after filtration, the powder is directly applied to a silica gel column, allowing efficient recovery of only the target product. It significantly reduces waste and processing time, and can also be applied to automation of experiments.

Product No	product name
FASTWORX-M	FastWoRX-M Magnetic Powder
FASTWORX-S	FastWoRX-S Sorbent Powder

FastWoRX referral link:



COMU: A Safer, Non-Explosive Alternative for Peptide Conjugation Reagents

Many peptide bonds are performed under 1-hydroxybenzotriazole (HOBt) and its derivatives, which have been identified as having explosive properties. In comparison, COMU is slower, more controllable and less thermally sensitive than HOBt-based HDMA and HDMB, while HDMA and HDMB are reported to exhibit unpredictable autocatalysis.

Product number	Product name	Purity	CAS number
851085	HOW	≥ 99.0% (HPLC)	1075198-30-9

Succinic acid, a raw material of biological origin

Succinic acid is used in various products and research fields, and can be applied to a wide range of syntheses.

is made.

Demand for succinic acid, which is manufactured from biological raw materials, is increasing due to rising environmental awareness.

Product number	Product name	CAS number
S7501	Succinic acid, ReagentPlus™, BioRenewable, >=99.0%	
S9512	Succinic acid, BioReagent, BioRenewable, suitable for cell culture, suitable for insect cell culture	110-15-6
S3674	Succinic acid, BioXtra, BioRenewable, >=99.0%	

Biodegradable lab cleaners: the Extran® series

Thorough, residue-free cleaning is critical for reliable experimental results.

The Extran® series uses biodegradable raw materials, making them friendly to the environment and the health of lab staff.

Product number	Product name
1.07558	Extran® AP 11, powder, mildly alkaline
1.07559	Extran® AP 21, liquid, acidic, concentrate (contains phosphoric acid)
1.07561	Extran® AP 22, liquid, acidic concentrate (contains citric acid)
1.07563	Extran® AP 12, powder, alkaline
1.07570	Extran® AP 41
1.40118	Extran® AP 18, liquid, mild alkaline concentrate



column

What is Green Chemistry? What Synthetic Organic Chemists Can Do



SDGs are "Sustainable Development Goals"

(Sustainable Development Goals)
to create a sustainable and better world

International targets have been set.

It is doubtful that organic chemistry will be deeply involved in this goal.

I have no choice.

New technologies and product development that can be brought about by organic chemistry
originated in achieving SDGs and solving environmental problems
is also key.

What can you do now in your daily research and work?

Why don't you think about it?

At Merck, in this catalog

In addition to the products introduced,
of sustainable research and development

We have products for

See website for details

Please refer

Big Science Smaller Footprint

責任ある科学研究のためのサステナブルなラボ製品、ソリューションおよびサービス



Sigma-Aldrich.
Supelco.
Millipore.

Introduction of examples of our initiatives for sustainability

SMASH package

As part of our efforts to reduce our environmental impact, we have established a Packaging Sustainability Framework to strategically promote significant improvements in packaging sustainability in collaboration with internal and external stakeholders. We call this the "SMASH package". We are developing and redesigning our product packaging, setting new sustainability standards and guidelines. We identified three focus areas with the greatest opportunities for improvement, and within each, we set four overarching goals to quantify, track and increase impact.

<Three priority areas>

- OPTIMIZE RESOURCES • MORE SUSTAINABLE MATERIALS • DESIGN FOR CIRCULAR ECONOMY

<Four Comprehensive Goals>

▶ Shrink – reduce packaging usage



We aim to eliminate oversized and heavy packaging that unnecessarily consumes more resources and increases energy use and air emissions during transportation. Excess packaging is also undesirable for customers due to the costs associated with managing and disposing of packaging.

▶ Secure – achieving zero deforestation



Deforestation is an important contributor to global warming and a threat to biodiversity. We aim to ensure that the wood and fiber-based packaging we use does not contribute to deforestation.

▶ Switch – Making plastic more sustainable Traditional plastic packaging



presents sustainability challenges. We aim to improve the sustainability of plastic materials used for packaging by promoting the use of materials with lower environmental impact and reducing the use of plastics containing chemical substances of concern.

▶ Save – Maximize Recycling



We aim to maximize the recycling of packaging by reducing the use of non-recyclable packaging and by providing recycling guidance for packaging.



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M-hub



Easy catalog search
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Science official SNS and video content.

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