



UNIQUE PROPERTIES FOR HIGH-TECH APPLICATIONS

Oxa acids may be used in the design of pro-drugs with tailored bioavailability, as unique reagents, or as speciality products in cosmetics, nanotechnology and other high-tech applications. Customers may choose from a portfolio of Oxa acids with one or two acid functions and a wide variety of different chain lengths for exactly tailored properties.

The most remarkable characteristics of Oxa acids are:

- Very broad liquid range due to low melting and high boiling points
- Unique combinati on of lipophilic and hydrophilic functions
- Water soluble
- Biologically degradable
- Excellent heat stability
- Outstanding complexing properties

The unique combination of lipophilic and hydrophilic functions makes these waterclear substances "multi combatants" with many strengths in various chemical and physical applications.



Enhanced pro-drug delivery system using Oxa acid technology

3,6-Dioxaheptanoic acid

Diglycolic acid

$$HO$$
 OH OH OH

Polyglycol diacid (n = 10-12)

3,6,9-Trioxaundecanedioic acid (TUDS)

PHARMACEUTICAL APPLICATIONS

- PEGylations of pharmaceuticals
- Enhanced pro-drug delivery system to increase the bioavailability of the API
- Lipid emulsion systems
- · X-ray contrast media
- Linker for chemical fixing of APIs and enzymes on solid support

PEGylation technology for APIs

PEGylation is an established drug delivery technology achieved by covalent coupling of polyethylene glycol (PEG) units to acti ve pharma ingredients. Oxa acids offer a new powerful "Oxa-PEGylati on strategy."

We offer a wide range of high quality Oxa acids, which consist of uniquely tailored Oxa-PEG chains as well as one or two suitably positioned carboxylic acid units.

These acid functions allow to attach Oxa-PEG chains to a wide range of APIs via chemical reacti on with appropriate functional groups. PEGylati on has been successfully applied to several marketed drugs, for instance in proteins and peptides.

PEGylating a drug substance provides multiple benefits, like:

- Optimized pharmacokinetics
- Increased bioavailability
- Increased potency
- Decreased immunogenicity
- Reduced dosing frequency

COSMETIC APPLICATIONS

- Skin care (exfoliating, moisturizing and anti-aging properties)
- Conditioner in shampoos
- Emulsifier for creams, lotions, hair dyes etc.
- Dental care and medicine (toothpaste, composites)

Skin exfoliatng agent

Oxa acids show strong benefits as skin exfoliating agents. Compared to the commonly used carbon backbone α -hydroxyacids, Oxa acids offer significant advantages: they combine a comparable or even higher efficiency with superior properties, such as liquid state and water solubility. Both are ensuring aesthetically demanding lotions and creams.



HIGH-TECH APPLICATIONS

- Nanotechnology
- · Dispersion agents for solids
- Scale inhibition (complexing of alkaline earth metals)
- Lubricants with a wide temperature range
- · High temperature cooling agents

Due to their extremely small particle size, nanotechnological products often have a high tendency to agglomerate, which may result in instability of dispersions and/or process constraints.

As a result, production processes usually need agglomeration inhibitors. Oxa acids stabilize particles by steric and electronic repulsion and therefore guarantee an excellent long-term stability of dispersions at low concentrations.

As described above, their properties can be tailored for each given application to control the effective particle size. Oxa acids can be used in water and solvent based dispersions. Again, their environmentally friendly properties are an additional benefit.

CHEMICAL APPLICATIONS

- Complexing agent in organometallic chemistry (extremely water soluble complexes)
- Phase transfer catalysis ("open crown ethers")
- Polar high boiling solvents and distillation additives
- Galvanotechnics

SERVICES ON OXA ACIDS

AMRI is able to deliver Oxa acids in commercial multiton quantities from our DIN ISO 9001:2008 certified production facilities in Frankfurt. On request we can provide laboratory samples of certain Oxa acids for your in-house testing (TODS, TUDS and DOODS available ex stock).

Our know-how and our laboratory and small scale equipment enables us to provide all kinds of customized developments.

	3,6 - Dioxaheptanoic Acid	3,6, 9 - Trioxadecanoic Acid	DIGLYCOLIC ACID 35% Solution in Water	3,6, 9 - Trioxaundecanedioic Acid	PLYGLYCOL Diacid	3,6 - Dioxaoctane- Dioic acid
CAS. NO.	16024-56-9	16024-58-1	110-99-6	13887-98-4	39927-08-7	23243-68-7
EMPIRICAL FORMULA	$C_5^{}H_{10}^{}O_4^{}$	$C_7^{}H_{14}^{}O_5^{}$	$C_4H_6O_5$	C ₈ H ₁₄ O ₇	_	$C_6H_{10}O_6$
DENSITY AT 20°C [g/CM3]	1.16	1.16	1.17	1.30	1.19	_
VISCOSITY AT 20°C [mPas]	35	73	4	8945	1524	_
ACID NUMBER [mg KOH/g]	ca. 410	ca. 310	ca. 350	ca. 440	ca. 180	ca. 586
BIOLOGICAL DEGRADABILITY	> 95% / 22d	> 95% / 23d	> 70% / 10d	> 95% / 13d	> 95% / 13d	> 95% / 7d