

Cyclodextrin

Type α , β and γ

For molecular biology and cell culture

Product Information

CAT No	Grade	Application	Storage
C1750	$\geq 98\%$ (HPLC), BioReagent	Molecular biology, bio chemistry and cell culture	RT
Product Name:	Cyclodextrin, Type α , β and γ		
CAS Number:	10016-20-3, 7585-39-9 and 17465-86-0		
Formula:	C ₃₆ H ₆₀ O ₃₀ , C ₄₂ H ₇₀ O ₃₅ and C ₄₈ H ₈₀ O ₄₀		
Molecular weight:	972.84, 1134.98 and 1297.12		
Melting point:	278, 260 and 267 °C (dec.)(lit.)		
Synonym:	cycloamyloses		

Suitability

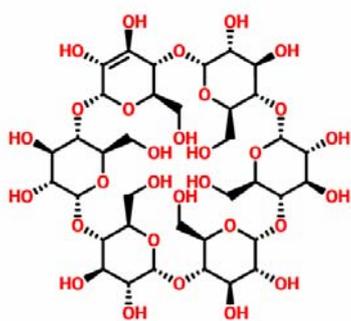
Cyclodextrins (also called cycloamyloses) are a family of compounds made up of sugar molecules bound together in a ring (cyclic oligosaccharides).

Cyclodextrins are produced from starch by means of enzymatic conversion. They are used in food, pharmaceutical, drug delivery and chemical industries, as well as agriculture and environmental engineering.

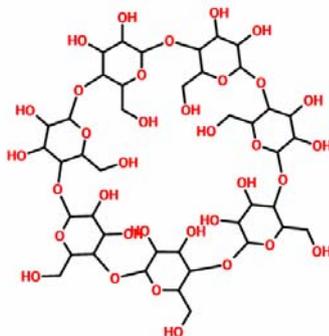
Cyclodextrins are composed of 5 or more α -D-glucopyranoside units linked 1 \rightarrow 4, as in amylose (a fragment of starch). The 5-membered macrocycle is not natural. Recently, the largest well-characterized cyclodextrin contains 32 1,4-anhydroglucopyranoside units, while as a poorly characterized mixture, at least 150-membered cyclic oligosaccharides are also known. Typical cyclodextrins contain a number of glucose monomers ranging from six to eight units in a ring, creating a cone shape:

- α -cyclodextrin: 6-membered sugar ring molecule
- β -cyclodextrin: 7-membered sugar ring molecule
- γ -cyclodextrin: 8-membered sugar ring molecule

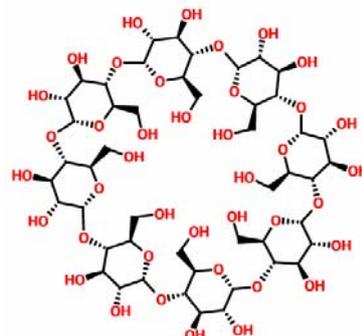
α - and γ -cyclodextrin are being used in the food industry. As α -cyclodextrin is a soluble dietary fiber, it can be found as α -cyclodextrin (soluble fiber) on the list of ingredients of commercial products.



α -cyclodextrin



β -cyclodextrin



γ -cyclodextrin

Fig. Chemical structure of the three main types of cyclodextrins.

Applications

Increasing bioavailability

Because cyclodextrins are hydrophobic inside and hydrophilic outside, they can form complexes with hydrophobic compounds. Thus they can enhance the solubility and bioavailability of such compounds. This is of high interest for pharmaceutical as well as dietary supplement applications in which hydrophobic compounds shall be delivered. Alpha-, beta-, and gamma-cyclodextrin are all generally recognized as safe by the FDA.

Cholesterol free products

In the food industry, cyclodextrins are employed for the preparation of cholesterol free products: the bulky and hydrophobic cholesterol molecule is easily lodged inside cyclodextrin rings that are then removed.

Multifunctional dietary fiber

α -Cyclodextrin has been authorized for use as a dietary fiber in the European Union since 2008. In 2013 the EU commission has verified a health claim for α -cyclodextrin. The EU assessment report confirms that consumption of α -cyclodextrin can reduce blood sugar peaks following a high-starch meal. Weight loss supplements are marketed from α -cyclodextrin which claim to bind to fat and be an alternative to other anti-obesity medications.

Due to its surface-active properties, α -cyclodextrin can also be used as emulsifying fiber, for example in mayonnaise as well as a whipping aid, for example in desserts and confectionary applications.

Other food applications

Applications further include the ability to stabilize volatile or unstable compounds and the reduction of unwanted tastes and odour. Beta-cyclodextrin complexes with certain carotenoid food colorants have been shown to intensify color, increase water solubility and improve light stability

The strong ability of complexing fragrances can also be used for another purpose: first dry, solid cyclodextrin microparticles are exposed to a controlled contact with fumes of active compounds, then they are added to fabric or paper products. Such devices are capable of releasing fragrances during ironing or when heated by human body. Such a device commonly used is a typical 'dryer sheet'. The heat from a clothes dryer releases the fragrance into the clothing.

Cyclodextrins are also used to produce alcohol powder by encapsulating ethanol. The powder produces an alcoholic beverage when mixed with water.

Aerosols

Aqueous cyclodextrin solutions can generate aerosols in particle size ranges suitable for pulmonary deposition. Large quantities of aerosol can be nebulized in acceptable nebulization times. The cyclodextrin concentration does not modify nebulization efficiency in the range tested.

Specification	
Grade	BioReagent
α -cyclodextrin	
Purity (HPLC)	$\geq 98\%$
Appearance (Color)	White
Appearance (Form)	powder
Solubility (Turbidity)	Clear, 10 mg/mL, H ₂ O
Infrared spectrum	Conforms to Structure
Water (by Karl Fischer)	$\leq 14.5\%$
Specific Rotation (anhydrous)	147-152 °, (C=1 in H ₂ O at 25 °C)
β-cyclodextrin	BioReagent
Purity (HPLC)	$\geq 98\%$
Appearance (Color)	White
Appearance (Form)	powder
Solubility (Turbidity) Clear 10 mg/mL, H ₂ O	Clear, 10 mg/mL, H ₂ O
Infrared spectrum	Conforms to Structure
Water (by Karl Fischer)	$\leq 14\%$
Specific Rotation (anhydrous)	147-152 °, (C=1 in H ₂ O at 25 °C)
optical activity	$[\alpha]_{20/D} +162 \pm 3^\circ$, c = 1.5% in H ₂ O
mp	290-300 °C (dec.)(lit.)
γ-cyclodextrin	BioReagent
Purity (HPLC)	$\geq 98\%$
Appearance (Color)	White
Appearance (Form)	powder
Solubility (Color)	colorless, 10 mg/mL, H ₂ O
Solubility (Turbidity)	Clear to Slightly Hazy, 50mg/ml 1M NH ₄ OH
Infrared spectrum	Conforms to Structure
Water (by Karl Fischer)	$\leq 10\%$
Specific Rotation (anhydrous)	147-152 °, (C=1 in H ₂ O at 25 °C)
Cell Culture Test	passed