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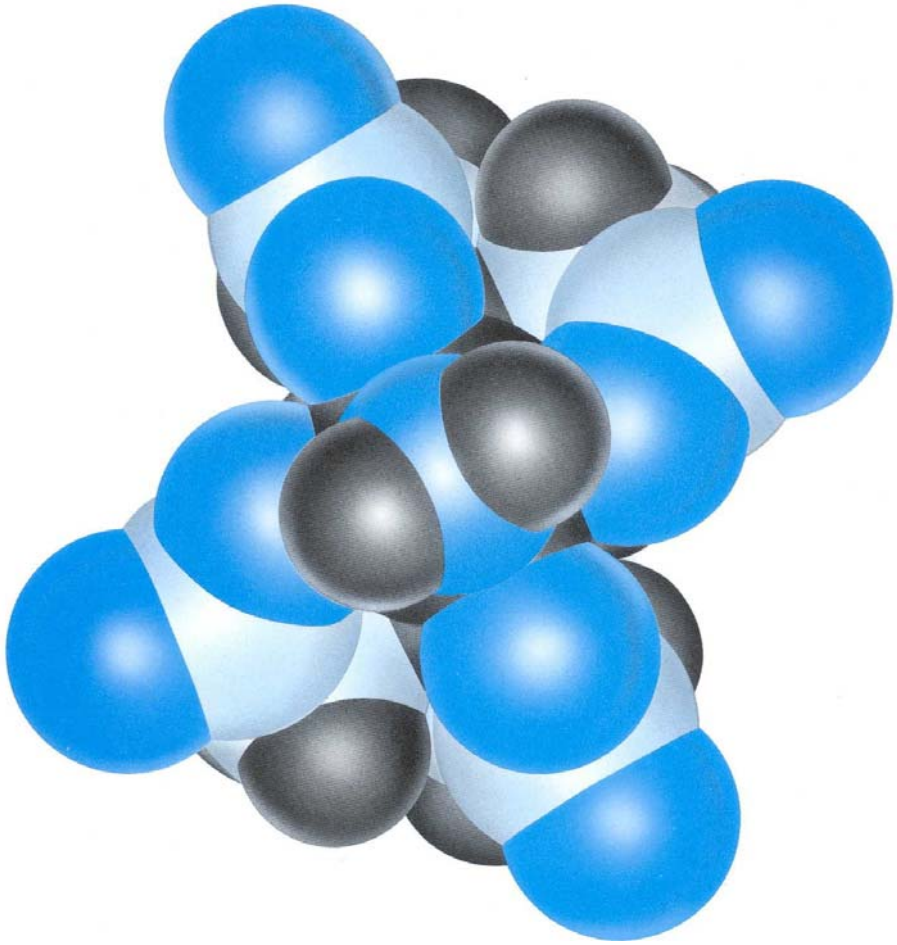
EUROPEAN AMINO-CARBOXYLATES PRODUCERS COMMITTEE

CHELATING AGENTS

Questions and Answers



EDTA

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What is EDTA ? Why is it used ?

EDTA is the abbreviation for **E**thylene **Diamine** **T**etra**A**cetate, which, in form of the sodium salts, has been used as a chelating agent for more than 50 years. A chelating agent (also called complexing or sequestering agent) is a compound which forms stable complexes with metal ions.

These chelating properties of EDTA can be widely used, e.g. for :

- masking free metal ions to avoid negative effects like:
  - precipitation of sparingly soluble salts (scale control in cleaners, water treatment)
  - product spoilage by metal catalysed oxidation processes (cosmetics, food, bleaching agents for detergents and pulp, pharmaceutical formulations).
- control of the oxidation conditions of metal ions (photography, sulfur removal from waste gases)
- adjustment of metal ion concentrations (galvano)
- correction of trace metals deficiency

Where is EDTA used ?

The main application areas in Western Europe in 1988 are estimated to be :

	%
Industrial and institutional cleaners	30
Household detergents	25
Photography	10
Textiles	10
Agriculture	10
Pulp and paper	
Metal plating	
Others	15

Due to the strong chelating power of EDTA only small concentrations (usually less than 1 %) are needed to control the trace amounts of metals present in the above application areas.

Only metal plating and photography need higher concentrations, because the chelate works as the active ingredient here.

What levels of EDTA are found in the environment ?

Recent monitoring studies in Western Europe have show that the levels of EDTA in rivers and lakes fluctuate depending on the wastewater load and the time of the year.

Studies in Germany during the last two years have shown average concentrations to be 30 ppb (µg/l)♦ in rivers and 3 ppb (µg/l) in lakes.

The levels in drinking water are generally lower than the corresponding source.

♦ *1 ppb means 1 **p**art **p**er **b**illion, that corresponds to 1 gramme in 1 million litres (or half a piece of sugar in a 50 m public swimming-pool).*
1 µg/l means 1 migrogramme per litre

Is EDTA biodegradable in the environment ?

Yes, but slowly.

EDTA is eliminated from the environment by biological and nonbiological pathways.

However, the rate of degradation is too slow to ensure efficient removal during the biological treatment of sewage.

Furthermore, in biological tests it can be demonstrated that EDTA is slowly biodegradable under aerobic conditions. However, the rate of biodegradation may vary strongly with the bacterial population present in the particular ecosystem.

EDTA, especially in the form of the EDTA-iron-chelate, is readily decomposed on exposure to sunlight and yields biodegradable products.

Both biodegradation and nonbiological degradation ensure that EDTA does not persist in the environment.

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Is EDTA harmful to humans or the environment ?

There is at the present time no indication of harmful effects of EDTA due to long-term exposure to low concentrations.

Calcium-disodium-EDTA is a permitted food additive in most of the countries of the EEC and the USA. EDTA is used to prevent deterioration of the food by metal catalysed oxidation.

A particular use of EDTA is an antidote to heavy metal poisoning in humans. It is listed in the U.S. Pharmacopea.

The World Health Organisation has assessed the acceptable daily intake of Calcium-disodium-EDTA to be up to 2.5 mg/kg♦ body weight. This means, that at the levels of EDTA being observed in drinking water a large margin of safety exists and no hazard to human health may be assumed.

The actual levels of EDTA found in the environment are not harmful to aquatic organisms.

♦ *That would correspond to a daily intake of 6.500 litres of water containing 300 ppb EDTA..*

Does EDTA remobilize heavy metals in the environment ?

No scientific evidence has been presented to date that the actual levels of EDTA in aqueous environment cause remobilization of heavy metals.

Latest findings show that remobilization of heavy metals (zinc, nickel, copper) out of the sediments of river does not occur as long as the equivalent concentration of EDTA is below that of the heavy metals in solution. If we consider the usual concentrations of heavy metals in river waters, no remobilization would be expected to occur at the currently observed EDTA levels.

The concentration of dissolved heavy metals in river waters is affected more by natural fluctuations in pH and salinity than by trace amounts of EDTA.

Summary

- EDTA is a chelating agent used to prevent undesirable effects of metal ions in a number of different end-uses.
- EDTA has been in use for 50 years and is a well-known substance.
- In rivers and lakes which also receive waste water from sewage treatment works very low levels (ppb range) of EDTA can be found.
- EDTA is biodegradable, but slowly. It also breaks down in the presence of light. It does not accumulate in the environment.
- EDTA is an approved food additive and is used to treat metal poisoning in humans.
- The actual levels of EDTA in the environment have no adverse affect on aquatic life.
- There is no evidence of heavy metal remobilization by EDTA in natural circumstances.