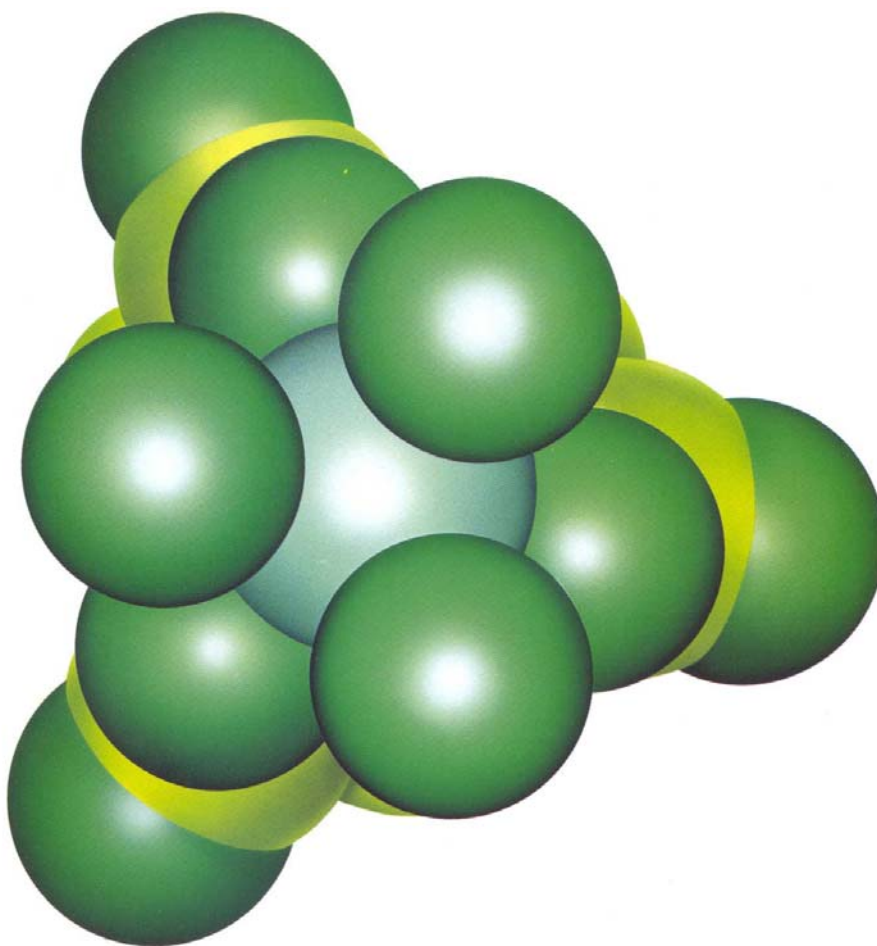

CHELATING AGENTS

Questions and Answers



NTA

EAC

What is NTA ? Why is it used ?

NTA is the abbreviation for **NitriloTriAcetic Acid** which in the form of its sodium salt has been in use 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.

Control of metal ion activity in aqueous systems is the main use of these chelating properties of NTA.

Thus precipitation of sparingly soluble salts e.g. of calcium and magnesium with inorganic anions, fatty acids and anionic surfactants can be avoided.

Typical applications are scale control in cleaners, water softening and as a builder in laundry detergents.

Where is NTA used ?

In Western Europe at least 80 % of the NTA is used in detergents.

NTA has the function of a builder in laundry detergents and is effective in maintaining their performance in the absence of phosphate.

NTA is instrumental in minimizing soil redeposition, incrustation, stiffening of fabrics and scale formation in washing machines.

Due to its high chelating capacity and the stability of its complexes in alkaline media at elevated temperatures, NTA is also used for control of water hardness in various types of cleaners and in the textile industry.

What levels of NTA are found in the environment ?

Since NTA is readily biodegradable only very low levels can be found in the environment.

Despite use patterns and volume varying from country to country, NTA levels in surface waters do not differ markedly.

The introduction of NTA in Swiss detergents from 1984 resulted in a more than 400 % increase in usage. Subsequent monitoring studies in Switzerland showed that environmental levels have not changed significantly. Typical values of NTA levels are :

rivers : < 10 ppb (µg/l) *
lakes : < 1 ppb (µg/l)
ground water : not detectable

- * 1 ppb means 1 **part per billion**, that corresponds to 1 gramme in 1 million litres (or half a teaspoon of sugar in a 50 m public swimming-pool).
1 µg/l means 1 microgramme per litre

Is NTA biodegradable in the environment ?

Yes.

Numerous laboratory and field tests have proved that NTA is readily biodegraded under environmental conditions. NTA breaks down into carbon dioxide, water and inorganic substances without forming residual metabolites.

In efficient sewage treatment plants NTA is removed by biodegradation to about 98 % under normal operating and loading conditions.

Climatic variations do not significantly affect the extent of biodegradation.

In spite of the high removal rates during waste treatment, NTA can still be detected at very low levels in surface waters, but it continues to be broken down : biodegradation of NTA has been observed in rivers, lakes and ground water thus preventing accumulation in the environment.

EAC

Is NTA harmful to humans or the environment ?

There is no indication of harmful effects of NTA due to practical long-term exposure levels.

NTA has been thoroughly tested in laboratory animals and no adverse effects were noted at or near likely human exposure levels.

At the high doses normally used in animal experiments NTA was shown to cause toxic effects in rats and mice. This was due to a disturbance of electrolyte metabolism and, consequently, damage of the tissues of the bladder, kidney and urinary tract. After prolonged ingestion tumor formation was also observed.

It has clearly been demonstrated that tumor formation cannot occur at doses below a threshold value of 15 mg/kg bodyweight / day. This level is at least 1,000 times higher than any expected exposure under normal conditions. ♦

The aquatic toxicity of NTA has been investigated for some 50 different test organisms. Neither acute nor chronic effects were found at concentrations less than 1,000 µg/l which is more than 100 times higher than the observed levels in rivers and lakes.

♦ *For humans to reach this level they would have to drink the entire content of a washing machine full of soapy water every week.*

Does NTA remobilize heavy metals in the environment ?

Because of its ready biodegradability residual quantities of NTA do not influence the balance of heavy metals in sewage treatment plants and rivers.

This has been demonstrated by numerous investigations in sewage treatment plants and with polluted river sediments.

Summary

- ♦ NTA is a chelating agent used to prevent undesirable effects caused by water hardness, mainly in detergents.
 - ♦ NTA has been safely used for more than 50 years.
 - ♦ NTA is readily biodegradable even under unfavorable conditions and thus does not accumulate in the environment.
 - ♦ NTA has proved not to be harmful at the long-term exposure levels found in practice.
 - ♦ NTA has no adverse effects on aquatic life at the levels normally found in the environment.
 - ♦ NTA has no measurable impact on the heavy metals balance in environmental systems.
-