

Solvitar[™] in food applications



Trace metals ions in food can cause several spoilage reactions and thereby degrade the quality and the shelf life of the food product. Trace metal ions will be present in all processed food products from raw materials, process water and process equipment. Solvitar[™] forms a stable complex with the trace metal ions and thereby prevents against these undesirable food spoilage reactions.

Function

There are two types of unwanted reactions in food and beverages which can be controlled by addition of Solvitar[™].

A reaction between trace metal ions and other organic and inorganic components can be retarded or prevented by addition of sequestering agents. The function of the product is to:

- Promote colour retention
- Promote texture retention
- Promote product clarity
- Act as anti-gushing agents
- Retard struvite formation

Furthermore sequestering agents control/reduce oxidation catalyzed by trace heavy metal ions. The function of the product is to capture the heavy metals and so to:

- Act as a preservative
- Promote colour retention
- Promote flavor retention
- Promote texture retention

These chelated metal ions do not influence the food taste or quality.

Applications

Many processed food products can suffer from spoilage reactions

caused by trace metal ions. In fat based products, like emulsified sauces and margarine, trace metal ions act as a catalyst in the oxidation reaction of the fats and thereby lead to rancidity.

Especially Poly Unsaturated Fatty Acids, like Omega-3, are highly sensitive for oxidation reactions and can be stabilized by the addition of Solvitar[™].

Fish and shellfish products naturally contain high concentrations of metals. This, in combination with organic components in the seafood itself can cause off-flavors, bad odors, rancidity and discoloration.

Enzymatic browning of vegetables like mushrooms and artichokes is catalyzed by trace metal ions. In canned legumes and corn, discoloration is caused by the reaction of trace metal ions with organic constituents in the vegetables. Iron ions present in processed potatoes, both canned and frozen, can lead to darkening or graying of the potato surface.

In soft drinks the addition of Solvitar[™] can support vitamin C stabilization and minimize colour fading and flavour loss. In beer

Solvitar[™] reduces gushing and promotes clarity.

Solvitar[™] can also prevent against spoilage reactions in pickles.

Specifications

Solvitar[™] is a food grade calcium EDTA complex and produced according to the most stringent regulations in our factory in Herkenbosch, the Netherlands. The free-flowing white microgranules are tasteless and odourless and meet the specifications of the Food Chemical Codex (FFC), the European directive 380/2012/EC, the United States Pharmacopoeia (USP), the European Pharmacopoeia (EP) and JECFA.

The production facility is certified according to ISO 9001, ISO 14001, HACCP (in accordance with the standard defined by the "Dutch national Board of Experts HACCP") and FSSC 22000 (Food Safety Certification Scheme for food manufacturing in compliance with ISO 22000 and PAS 220) Solvitar[™] is Kosher/Parve and Halal certified.

Dosage levels

Solvitar[™] is recognized as suitable for use in foods by JECFA in conformance with codex Stan 192-1995 and is approved as food additive in the EU (food code E385) and by the FDA.

| Food category | Approved dosage in the US (FDA) | mg/kg | Approved dosage in the EU | mg/kg |
|-------------------------------|---|---------|--|-------|
| Dressings & sauces | Dressings | 75 | Emulsified sauces | 75 |
| | Mayonnaise Sauces | | | |
| Spreads | Oleomargarine | 75 | Spreadable fats* | 100 |
| | Sandwich spread | 100 | | |
| | Spreads, artificially coloured and lemon- or orange flavoured | 100 | | |
| Seafood | Clams (canned) | 340 | Canned and bottled crustaceans , molluscs and fish | 75 |
| | Crabmeat (canned) | 275 | Frozen and deep-frozen crustaceans | 75 |
| | Shrimp (canned) | 250 | | |
| Fruit & Vegetables | Dried lima beans (canned) | 310 | Canned and bottled pulses | 250 |
| | Legumes** | 365 | Canned and bottled legumes | 250 |
| | Mushrooms (canned) | 200 | Canned and bottled mushrooms | 250 |
| | Pink-, and red beans (canned) | 165 | Canned and bottled artichokes | 250 |
| | Processed dry pinto beans | 800 | | |
| Potatoes | Potato salad | 100 | | |
| | Canned white potatoes | 110 | | |
| Pickles | Cabbage & cucumbers | 220 | | |
| Beverages | Canned carbonated soft drinks | 33 | | |
| | Distilled alcoholic beverages | 25 | | |
| | Fermented malt beverages | | | |
| Miscellaneous | Colour mixtures for food and drugs | 1%*** | Hungarian goose liver | 250 |
| | Egg product | 200**** | | |
| | Spice extractives in soluble carriers | 60 | | |
| | Pecan pie filling | 100 | | |

* Having a fat content of 41% or less as defined in Annexes B and C to regulation (EC) No 2991/94

** All cooked canned other than dried lima-, pink-, and red beans

*** 21CFR 73.1, 1% by weight of the diluent

**** By weight of egg yolk portion. Egg product that is hard-cooked and consist of egg white with an inner core of egg yolk

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Performance

Trace metal ions can decrease the quality of the food products during processing and/or storage.

Sequestering agents, like SolvitarTM, form very stable chelates with metal ions.

The stability constant log K is an indication for preferential metal - chelate combination (see table). In a solution that contains various metal ions and a chelating agent, the most stable combination of metal ion and sequestering agent will be formed at equilibrium.

| Metal | Log K EDTA | CV* Solvitar TM |
|------------------|------------|----------------------------|
| Fe ³⁺ | 25.1 | 7.3 |
| Cu ²⁺ | 18.8 | 6.4 |
| Ni ²⁺ | 18.4 | 7.0 |
| Zn ²⁺ | 16.5 | 6.3 |
| Co ²⁺ | 16.5 | 7.0 |
| Fe ²⁺ | 14.3 | 7.3 |
| Mn ²⁺ | 13.9 | 7.5 |

CV* = Chelating value; Calculated weight of product needed for one weight part of metal

For example, Fe³⁺ has the highest log K

Addresses

Europe, Middle East and Africa

Akzo Nobel Functional Chemicals bv
 Stationsstraat 77525
 P.O. Box 247
 3800 AE Amersfoort
 The Netherlands
 T: +31 33 467 6341
 E: eur@dissolvine.com

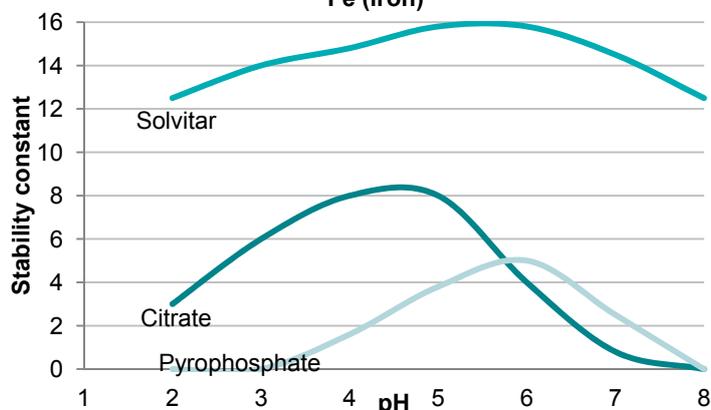
value, so this metal ion will be chelated in preference over the other metal ion present in the system.

In practice iron and copper form the most stable chelates with SolvitarTM. The stability is affected by several conditional factors, including pH, temperature, presence of other metal ions and electrolyte concentration. The influence of the pH is the largest factor.

In food products, copper and iron are the most common metal ions and SolvitarTM chelate these two metal ions effectively in the pH-range of 2-10.

Longer shelf lives and an efficient control of metal ions can be established by high stability constants. Sometimes products like citric acid and phosphates are promoted as sequestrants for food applications, but the stability constants for these products are much lower and therefore the

Conditional stability constants Fe (iron)



performance in food will also be less.

In the graph you can see the stability constants for Solvitar, citrate and pyrophosphate for iron in typical food pH range and you can conclude that the performance of citrate and pyrophosphate are not even coming close to the performance of SolvitarTM.

Other information

For transport, handling and first aid instructions: please refer to the Safety Data Sheets which are available on request.

For samples, technical service and further information, please contact your nearest AkzoNobel representative at any of the addresses listed below.

North, Central and South America

Akzo Nobel Functional Chemicals LLC
 W. van Buren Street
 Chigaco, Illinois 606
 U.S.A.
 T: Inside U.S.A. +1 800 906 7979
 Outside U.S.A. +1 312 544 7000
 E: nam@dissolvine.com

Asia Pacific

Akzo Nobel Chemicals (Ningbo) Co. Ltd.
 22F, Eco city
 No. 1788 West Nan Jing Road
 Shanghai 200040
 P.R. China
 T: +86 21 2220 5000
 E: ap@dissolvine.com

