STABILIZING VOLATILE OR SENSITIVE INGREDIENTS USING CAVAMAX® CYCLODEXTRINS

Functional foods experience a strong increase in popularity, but they are also demanding in terms of formulation. The difficulty lies in integrating antioxidants, plant extracts and other functional ingredients into the food matrix in sucha way that they remain stable over the course of their shelf life and still contain the defined amount at the time of consumption. CAVAMAX® cyclodextrins demonstrate a new approach.

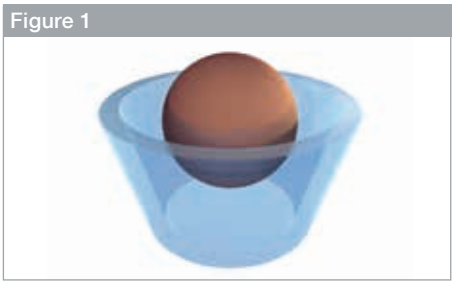
Protection for Valuable Ingredients

Vitamins, anti-oxidants, flavors, many different plant extracts and also some colorants are often attacked by light, low pH values, high temperatures or acids and must therefore be stabilized. CAVAMAX® cyclodextrins permit reliable and efficient stabilization in many cases.

A Perfect Solution: CAVAMAX®

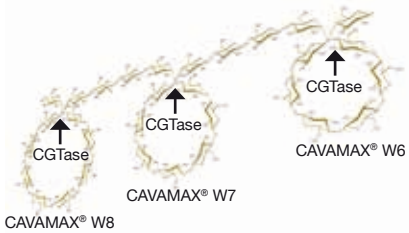
The ring-shaped molecules surround sensitive and protect them from outside influences. CAVAMAX® cyclodextrins have a donut-shaped three-dimensional structure. Their hydrophobic inside attracts hydrophobic guest molecules.

Figure 1



Their hydrophilic outside allows them to be used in liquids, e.g. beverages. Formulation with CAVAMAX® does not change the nutritional value or functionality of the ingredient. So that the substance fits into the cavity, parts of the substance or all of it must be hydrophobic and fit into the inside with regard to its dimensions (see figure 1).

Figure 2



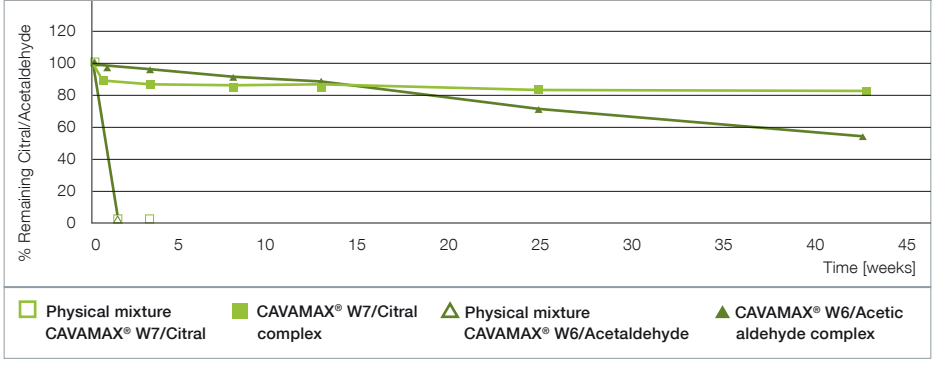
CAVAMAX® cyclodextrins are produced enzymatically from starch by WACKER using a patented process. WACKER is a global leader in cyclodextrin production and is the only producer to offer three different types with a 6-, 7- or 8-ring. They therefore have different inner diameters..

For a Variety of Applications

A large number of ingredients are stabilized with CAVAMAX®. Volatile flavors such as vanillin, menthol, citral, acetaldehyde, benzaldehyde and many more can be protected. Inside the CAVAMAX® cyclodextrin, these volatile substances can be stabilized against heat. Thus it is possible to minimize the loss of the precious flavors during prolonged periods at elevated temperatures.

Guest	Character	Applications
Citral	Lemon, lime, apple, orange	Tea, fruit juice, ice-cream, chewing gum, candy, soft drinks
Menthol	Peppermint, spearmint	Chewing gum
Benzaldehyde	Almond, cherry	Candy, tea, bakeries, cereals, ice-cream, chewing gum
Vanillin	Vanilla	Tea, baked goods, cereals, ice-cream
Trans-2-hexenal	Green apple, cucumber	Candy, soft drinks

Graphic 1: Stabilization of Citral and Acetaldehyde with CAVAMAX® Cyclodextrins



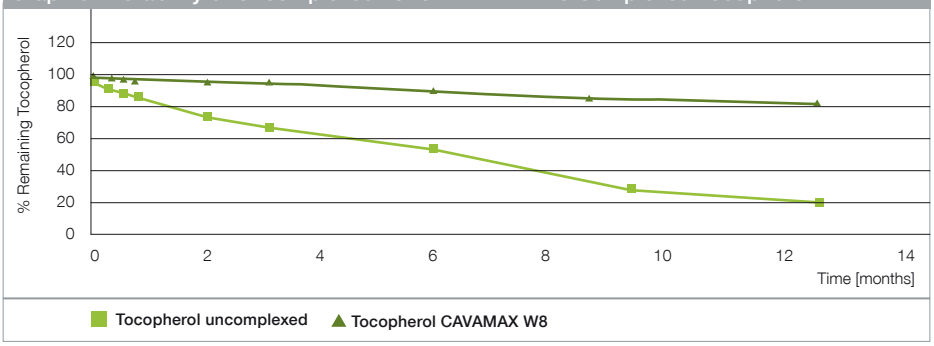
Storage at room temperature. The results show an enhanced stability of CAVAMAX® complexed citral and acetaldehyde compared to the physical mixtures.

Apart from flavors, functional ingredients such as antioxidants and vitamins also fit into the cyclodextrin cavity. Safely tucked away into the CAVAMAX® cyclodextrins, these solutions can be applied with many food categories, including dietary supplements. The 'safety coat' prevents, for example, the polymerisation of alpha-lipoic acid (ALA). Tocopherol, a form of vitamin-E, is also stabilized markedly against heat (see graphic 2).

Proven Solution: Stabilization of Alpha-lipoic Acid

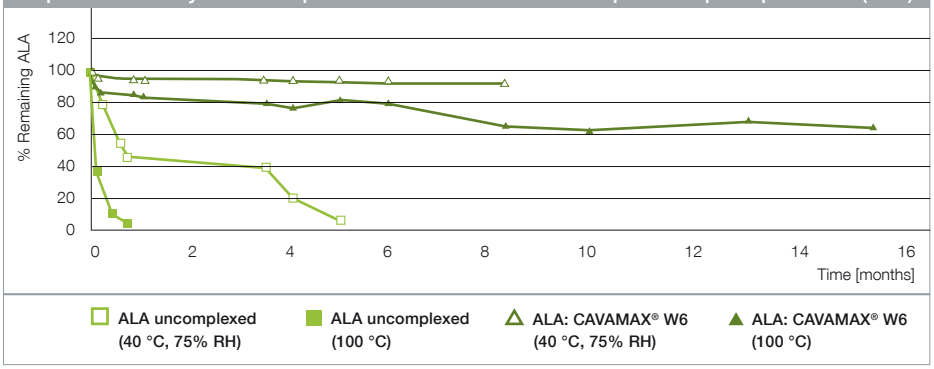
Alpha-lipoic acid (ALA) acts as an efficient radical scavenger and can regenerate other used antioxidants (vitamin C, vitamin E, coenzyme Q10). ALA is often used in powdered sports nutrition products, because it supports muscle regeneration after physical exercise. This is difficult, because ALA is very sensitive – particularly against heat and the presence of certain minerals. Even in its dry state, ALA polymerizes easily and loses its effect. The sensitive molecule is protected as it is embedded in CAVAMAX® cyclodextrins (see graphic 3).

Graphic 2: Stability of Uncomplexed vs. CAVAMAX® W8 Complexed Tocopherol



Storage of tocopherol and CAVAMAX® W8 complexed tocopherol at 40 °C, 75% rel. humidity for several months. The results show an enhanced stability of the complexed tocopherol for 12 months compared to the uncomplexed tocopherol.

Graphic 3: Stability of Uncomplexed vs. CAVAMAX® W6 Complexed Alpha-lipoic Acid (ALA)



Storage of alpha-lipoic acid (ALA) and CAVAMAX® W6 complexed ALA at 40 °C, 75% rel. humidity (open symbols) or at 100 °C (closed symbols) for several months. The results show an enhanced stability of CAVAMAX® W6 complexed alpha-lipoic acid (ALA) in comparison to non-complexed ALA.

CAVAMAX®

Wacker Chemie AG, Tel. +49 89 6279-1346
Wacker Chemical Corp., Tel. +1 517 264 8671
Wacker Chemicals (China) Co., Ltd., Tel. +86 21 6100 3535
Wacker Química do Brasil Ltda., Tel. +55 11 4789-8087
info.biosolutions@wacker.com

6751e/10.13 replaces 6751e/06.11