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CREATING TOMORROW'S SOLUTIONS

INFO SHEET I IMPROVED BIOCIDES I CAVAMAX® & CAVASOL®

CAVAMAX® & CAVASOL® – CYCLODEXTRINS FOR NEW IMPROVED BIOCIDE FORMULATIONS

Prevention of microbial spoilage is essential in all aqueous-based products. Waterborne paint formulations contain sufficient nutrients to maintain bacterial growth if the pH and temperature are right. In-can contamination originates from the raw materials, the process water used and the production equipment. To prevent problems, it is necessary to incorporate microbiocides. CAVAMAX® and CAVASOL® cyclodextrins can help to produce biocides with improved stability and solubility.

Problems Associated with the Use of Biocides

Today's biocides are chemicals that are intrinsically toxic to organisms, frequently irritant to humans and harmful to the environment. Accordingly, the registration of new active biocides is an extremely rigorous, time consuming and expensive process. The biocides must be stable, cost-effective and compatible with the other components in the formulation, and must not affect the rheological properties of the formulation or the color of the dried film. Nowadays, they also have to be registered for use, and need to be safe to use and of low environmental impact.

Improvements in performance therefore need to be the result of improved formulations.

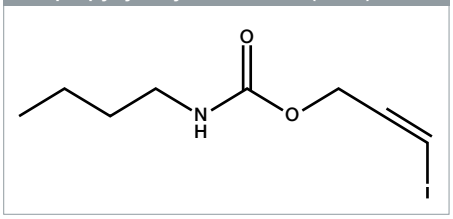
CAVAMAX® and CAVASOL® Cyclodextrins

CAVAMAX® and CAVASOL® cyclodextrins are a well-known group of natural carbohydrates, which in water are able to encapsulate other organic molecules in a reversible equilibrium-controlled process. This 'molecular encapsulation' effectively modifies the properties of the organic guest molecules, e.g. reduces their volatility, extends their release over time, and improves their stability and solubility in water.

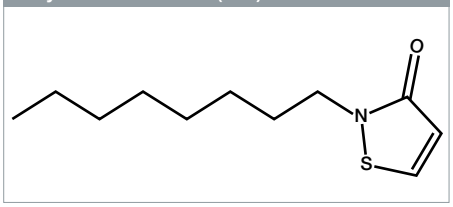
Cyclodextrin-based formulations containing the biocide iodopropynylbutyl carbamate (IPBC) have been developed and marketed for more than 15 years.

Recent work has shown that the biocide octylisothiazolinone (OIT) can deliver an equivalent level of performance.

Iodopropynylbutyl Carbamate (IPBC)



Octylisothiazolinone (OIT)



Benefits of Cyclodextrin Inclusion Complexes in Water-Borne Paint Formulations

Increased bioavailability

Controlled release

Emulsifying effect
- Emulsion stabilization
- Compatibilization

Solubilization
- Enhancement of solubility in water
- No organic solvents
- No change in rheological properties

Masking
- Unpleasant odor
- Bad taste

Stabilization against
- Light, UV radiation
- Heat and cold
- Oxidation

Reduction of volatility
- Flavors
- Gases

Selective extraction
- Cleaning effect
- Absorption

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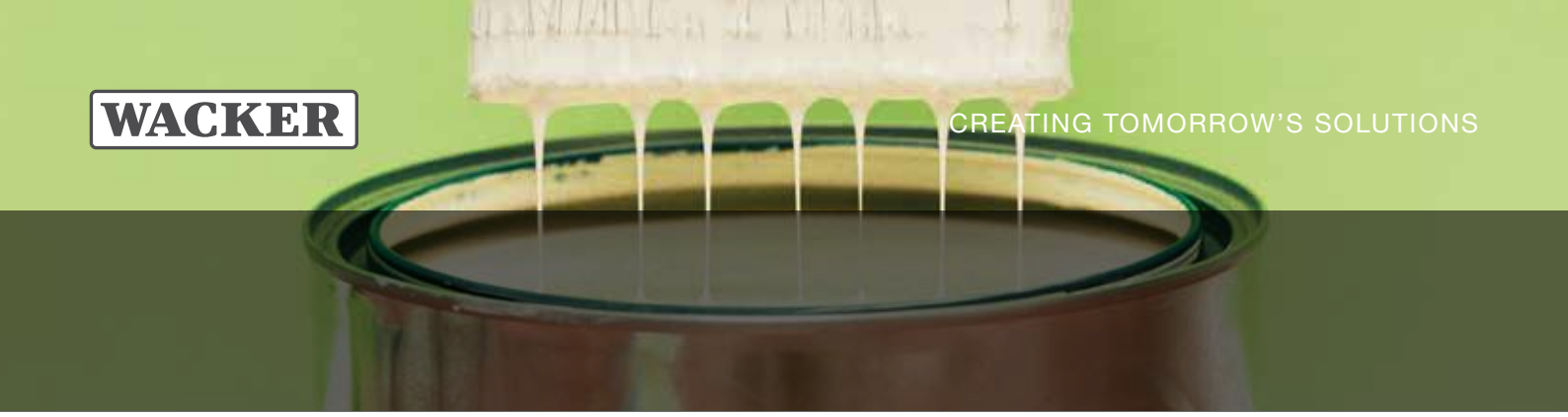

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Octylisothiazolinone (OIT)

A broad-spectrum, fast-acting antifungal with good heat and pH stability, OIT is recommended for use in paints, coatings, inks, household cleaning products, adhesives, building materials, polymer emulsions, leather, laundry mildewcides, plastics, textiles, paper-coating materials, wood-treatment solutions, metalworking fluids, and hydraulic fluids.

Efficacy and Performance Testing

Selected biocide complexes were tested according to industry-standard methods.

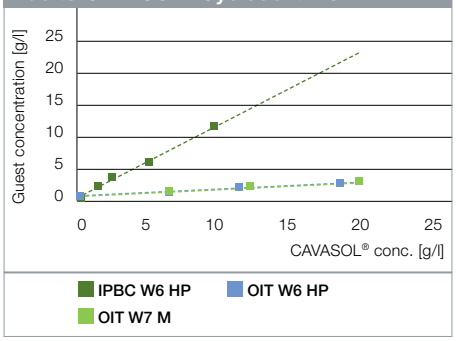
CAVASOL® cyclodextrins significantly enhanced the solubility of OIT in water, opening up scope for formulations that are free of VOCs and/or surfactants.

Incorporation of CAVASOL® OIT into coating formulations did not impact the coating performance or properties and imparted an equivalent level of in-can preservation to the product.

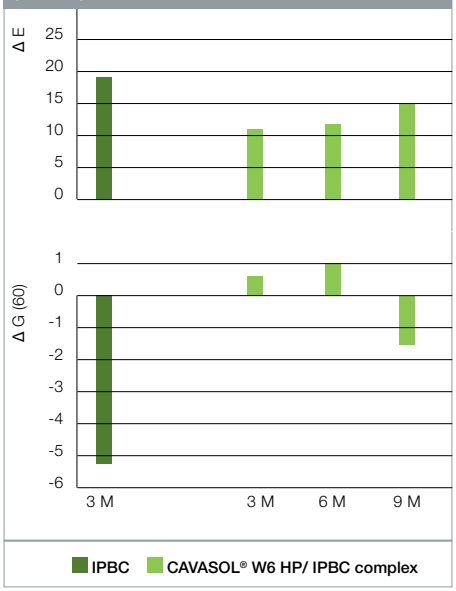
CAVASOL® Cyclodextrin Biocide Performance in Coatings

	Water-Borne Wood Glaze	Floor Emulsion	Facade Paint
OIT			
W6 HP	No growth	No growth	No growth
W7 M	No growth	No growth	No growth
IPBC			
W6 HP	No growth	No growth	No growth
W7 M	No growth	No growth	No growth

Improved Solubility of IPBC & OIT in Water Due to CAVASOL® Cyclodextrins



Change in Color and Gloss of Wood Glaze on Pine



Iodopropynylbutyl Carbamate (IPBC)

IPBC exhibits efficacy against a broad spectrum of fungal species. It is a preservative used globally in the paints and coatings, wood preservatives, personal care, and cosmetics industries. It was orriginally developed for use as a dry-film preservative for protecting interior and exterior coatings from mold, mildew, and fungal growth. Nowadays, it is also incorporated into a wide variety of interior and exterior paint formulations around the world to act as an in-can preservative.

CAVASOL® highly soluble cyclodextrins significantly enhanced the solubility of IPBC in water, opening up scope for formulations that are free of VOCs and/or surfactants.

Outdoor tests on coatings containing CAVASOL® OIT demonstrated improved resistance to microbial growth on the film.

Incorporation of CAVASOL® IPBC into coating formulations did not impact the coating performance or properties and imparted an equivalent level of in-can preservation to the product.

References / sources:
Biocidal Products Regulation 528/2012/EC (BPR)
Annex I: Active Substances of the BPR, Category 4, Traditionally used substances of natural origin.
Annex V: PT6 Preservatives for products during storage (in-can preservatives)

CAVAMAX® CAVASOL®

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