

Borchers' Anti-skinning Agents and Anti-oxidants

Ascinin[®] and Borchini[®] Nox

Modern anti-oxidants for air-drying coating systems

Over the course of its lifecycle, every material undergoes a continuous change in its properties due to molecular processes caused by the effects of:

- light
- heat
- oxygen
- ozone
- moisture
- trace metals
- high-energy radiation

This process is called aging. To prevent or at least delay the aging process, use is made of stabilizers (anti-oxidants). Some of the technical fields of application for anti-oxidants and the processes they prevent are:

- Plastics + rubber (aging, embrittlement)
- Fat + grease (rancidness)
- Oils and petroleum spirits (gumming and sludge formation)
- Coating materials (skinning)

Skin formation on coatings is a special case of the chemical aging of materials:

Oils and binders that undergo oxidative crosslinking by reaction with oxygen and as a result form a solid polymer film, may undergo surface skin formation during storage. Therefore, in air-drying systems, skinning thus means the premature, undesirable crosslinking of the binder at the atmospheric interface (surface) under the influence of the oxygen in the air.

THE FUNCTION OF ANTI-OXIDANTS

Anti-oxidants are used to prevent skin formation in air-drying coating systems that contain driers as accelerators. These usually are organic compounds that can inhibit or delay the undesirable oxidative processes caused by the influence of oxygen during storage.

A distinction is made between two different mechanisms of action:

(1) Use of radical interceptors

Radical interceptors do react with the atmospheric oxygen diffusing into the binder and form stable, non-reactive radicals. For this application, use is generally made of phenolic anti-oxidants, preferably sterically hindered products.

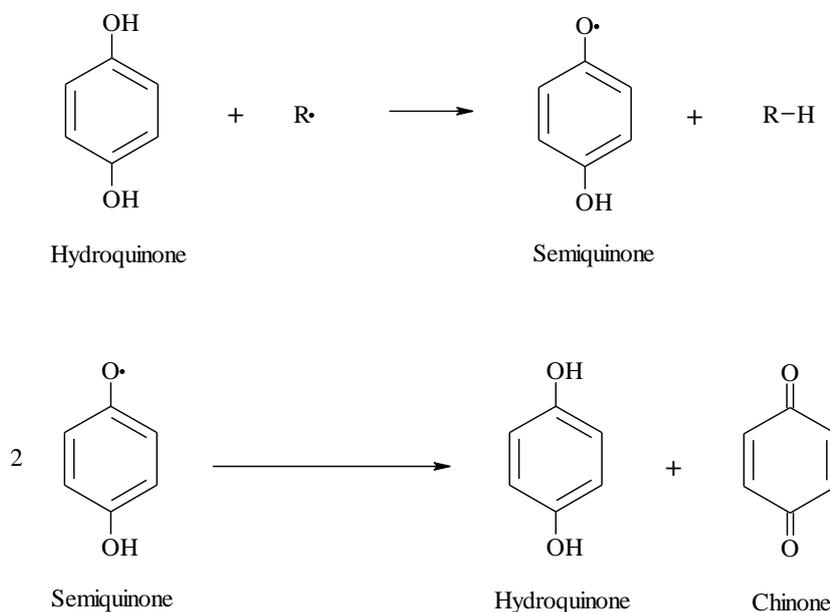
(2) Use of complexing agents

Complexing of the siccativ metal with organic complexing agents causes a temporary deactivation of the oxo-catalytic center. The most important group of these metal ion deactivators are aliphatic ketoximes.

OMG Borchers offers compounds with both mechanisms of action for different applications under the brand names ASCININ® and BORCHI® NOX.

Radical interceptors

Radical interceptors react with the free radicals formed during auto-oxidation, e.g. $R\cdot$, $R-O\cdot$, $R-OO\cdot$ and deactivate them. A simple example is hydroquinone:



Sterically hindered phenolics can, in addition to transferring a hydrogen atom, also bind the resultant peroxy radicals $R-OO\cdot$.

A typical feature of phenolic anti-oxidants is that, being genuine oxygen inhibitors, they have a very good anti-skinning effect. However, they also have the disadvantage that, due to their generally very low vapor pressure, they have low volatility and may therefore delay the drying of a coating to an undesirable extent. Correctly metered and applied, they regulate shelf life, drying and film hardness.

Metal ion deactivators

Metal ions that can be reversibly oxidized by atmospheric oxygen and are present in several stable oxidation stages can accelerate film formation and curing in oxidatively drying binder systems. In this case, these "pro-oxidants" are used specifically as driers for catalysis. By addition of suitable complexing agents, it is possible to make these catalysts temporarily ineffective by masking them as oxygen carriers during storage. This can be achieved by converting the metal siccatives into complex compounds that have no or only weak drying properties. On the other hand, the resulting complex compounds have to be quite instable. After application of the coating, they will quickly break down by evaporation of the complexing agent and catalytic crosslinking can take place. It has been found that ketoximes and aldioximes are particularly suitable as deactivators as they have favorable technical properties. The products most commonly used today are butanone oxime (methylethylketoxime, MEKO) and cyclohexanone oxime. Complexing agents do not interfere with the auto-oxidation mechanism.

Synergism

Synergism is given if the effect of a mixture of substances exceeds the sum of their individual effects. Generally speaking, synergists enhance the desired effect in the coating system. Highly effective anti-oxidants can be produced by combining a radical interceptor with a metal complexing agent. However, the anti-oxidative effect can also be improved by further measures as e.g. additional combination with UV stabilizers.

PRODUCT OVERVIEW

Borchi® Nox and Ascinin® are registered trademarks of OMG Borchers GmbH, Langenfeld; Germany. These are product names of anti-oxidants and anti-skinning agents we produce and market for all types of oxidatively drying coating systems.

			Possible application		Application fields								Addition rate
	waterborne	solventborne	Incorporation	Sprayed	Packaging	Printing Inks	Automotive	Industrial Wood	General Industrial	Deco	Pigment Dispersions	Composites	
Ascinin® Anti Skin 0445	X	X	X	X		XX		X	XX	XX	X		Paints: 0.2-0.6% printing inks: 0.5-2.0% pigment pastes: 1.0-3.0% %
Ascinin® Anti Skin 0444		X	X	X		XX		X	XX	XX	X	X	Paints: 0.2-0.6% printing inks: 0.5-2.0% pigment pastes: 1.0-3.0% %
Ascinin® Anti Skin 1240		X	X	X		XX		X	XX	XX	X		Paints: 0.2-0.6% printing inks: 0.5-2.0% pigment pastes: 1.0-3.0% %
Ascinin® P		X				X		X	XX		XX	X	1,0 - 3,0 %
Ascinin® Special		X				X		X					1,0 - 3,0 %
Borchi® Nox 614		X				XX	X	X	X		XX	X	1,0 - 3,0 %
Borchi® Nox C3		X				XX		X	X	XX			0,5 - 2,0 %
Borchi® Nox 1640		X						X	X	XX			1,5 - 6,0 %
Borchi® Nox M2		X	X	X		XX	X	XX	XX				0,2 - 1,0 %

XX = especially recommended
 X = recommended

➤ **Ascinin® P and Borchi® Nox 614**

are phenolic anti-oxidants in different solvent mixtures. They are noted for their strong anti-skinning activity, low odor and good solubility in organic media.

➤ **Borchi® Nox M2 and Borchi® Nox 55**

are ready volatile Anti-skinning agents based on butanone oxime for universal application. Their advantages are the low dosages, little influence on drying times and neutral color.

➤ **Borchi® Nox C3**

is a 100% product based on cyclohexanone, flakes.

➤ **Borchi® Nox 1640**

is an anti skinning agent based on Cyclohexanone oxime. Active content is 30% dissolved in DPM. It is recommended in combination with cobalt replacement driers like e.g. the driers of our Borchi® OXY - Coat series. The volatility of Borchi® Nox 1640 is higher than given with Ascinin® Anti Skin 0444 and 0445.

➤ **Ascinin® Special**

is a blend consisting of butanone oxime as a complexing agent and a phenolic radical interceptor. Therefore, it covers a broad range of applications and has high effectiveness.

Ascinin® Anti Skin

is a line of highly effective anti-oxidants for air-drying coatings and printing inks. Due to their special combination of active ingredients, they have a very pronounced anti-skinning action. The products are phenolic-free and oxime-free. In addition, they can be used as a general-purpose product regardless of the siccative metal.

➤ **Ascinin® Anti Skin 0445**

is dissolved in an glycolic solvent. It is therefore suitable both for conventional solventborne and for highly polar and waterborne formulations. Ascinin® Anti Skin 0445 thus covers a broad spectrum of coating systems and can be regarded as a general-purpose product.

➤ **Ascinin® Anti Skin 0444**

is dissolved in a VOC-free fatty acid ester with a high-boiling point, making it the product of choice for low-VOC and high-solids formulations and ester-based printing inks. The product can be added in as a replacement for corresponding phenolic anti-oxidants or it can be applied onto the ink surface in the container instead of butanone oxime.

➤ **Ascinin® Anti Skin 1240**

is dissolved in a VOC-free, fatty acid ester with high boiling point. Especially recommended for use with cobalt replacements like our Borchi® OXY - Coat series. It is very suitable for VOC-reduced coatings. Ascinin® Anti Skin 1240 shows a higher volatility than Ascinin® Anti Skin 0445. The product can be applied onto the ink surface in the container instead of butanone oxime (MEKO).

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