A novel antioxidant blend

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Who we are

We provide scientific services in:

• research on safety and efficacy of essential oils, natural raw materials and natural cosmetics

• development of natural cosmetics, raw materials and aroma therapeutic products
Who is AOT

We provide a wide selection of base oils and active ingredient oils for natural cosmetic manufacturers/producers.

Our oils are certified ORGANIC (Ecocert) and COSMOS (BDIH) - therefore comply with the guidelines of certified organic cosmetics.
Location of both companies
Oxidation challenges

Quality is just a condition
Oxidation in fragrances

Perfumes have the highest risk of radical formation of peroxides and oxygen induced allergens

Oxidation in fragrances

Essential oil components

Heat → Isomerization
Light → Oxidation
Air → Dehydrogenation

Polymerization
Thermal rearrangements
Experimental and clinical studies have shown that there are fragrance substances that act as prehaptens, i.e. their sensitization potency is markedly increased by air exposure due to oxidation (autoxidation).

The clinical studies show that the exposure to allergens formed due to autoxidation causes significant contact allergy in consumers.
Air oxidation of prehaptens can be prevented to a certain extent by measures during handling and storage of the ingredients and final products to avoid air exposure, and/or by addition of suitable antioxidants. The prevention of autoxidation using antioxidants needs thorough investigation because antioxidants can exert their function by being oxidised instead of the compound that they protect and might thereby be activated to skin sensitising derivatives after oxidation.

Source: SCCS OPINION on Fragrance allergens in cosmetic products 2012
Oxidation in fragrances

Source: Hauck 2009; Hausen et al. Reichling et al.
Oxidation in fragrances

Not only formation of allergens occur challenges especially formation of peroxides induce irritations

Data are insufficient ➔ More research demanded

Source: SCCS OPINION on Fragrance allergens in cosmetic products 2012
Oxidation in fragrances

Unstable UV filters and actives can induce the peroxide concentration by UV light

Source: Jung et al. Kosmetika World November 2015
Oxidation in fragrances

Peroxides in (Suncare) Products Induce Acne Aestivalis

Source: Hauck et.al. 2009; Photo : Dermatronnier;
Oxidation in cosmetics

Unsaturated fatty acids and emulsifiers can increase lipid oxidation by autoxidation or under UV Light

Oxidation in cosmetics

Some antioxidants can react prooxidative (e.g. Vit. C and E)
Current answers on oxidation by the industry

A lot of companies are not aware of the challenge
Current answers on oxidation by the industry
Cooling of raw materials

Sentence of Schwarz - Thermodynamik

\[
\frac{\partial}{\partial y_i} \left( \frac{\partial z}{\partial y_j} \right) = \frac{\partial^2 z}{\partial y_i \partial y_j} = \frac{\partial^2 z}{\partial y_j \partial y_i} = \frac{\partial}{\partial y_j} \left( \frac{\partial z}{\partial y_i} \right)
\]
Current answers on oxidation by the industry

Synthetic Antioxidants like BHT / BHA

- BHT toxicological data are not clear.
- Some studies proof endocrine action some not.
- Sensitizing potential is evident.
- Environmental behavior in investigation.
- Synthetic ingredients are designed for a long stability. Eco friendly? Accumulation effects?

Source: Schrader und Cooke, 2000; Jobling et al., 1995; Wada et al., 2004
Current answers on oxidation by the industry

Natural Antioxidants like Vitamin E and their blends

• No long term stability from Vitamin E (prooxidative effects) No 1 AO in natural cosmetics
• The most blends are designed for oils and creams but not for fragrance
• Often the skin benefit is in focus but not product protection
Current answers on oxidation by the industry

Standard Antioxidants are often used with similar concentration in all products

The usage of Antioxidant amount in products is always a case to case decision!
A novel antioxidant blend
All external tests were performed at the leading labs in their field.
The Antioxidative Power (AP) determined by using Electron Spin Resonance (ESR) spin probing techniques.
Antioxidative power from StoppOx

StoppOx: 227,000

BHA: 87,000
Duration of effect from StoppOx

- StoppOx
- BHA
- Vitamin E

time
Radical Potential (RP) determined by using Electron Spin Resonance (ESR) spin probing techniques.

<table>
<thead>
<tr>
<th>Irradiation time</th>
<th>UV dose (J/cm²)</th>
</tr>
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<tbody>
<tr>
<td>30 s</td>
<td>0.696</td>
</tr>
<tr>
<td>60s</td>
<td>1.392</td>
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<tr>
<td>120s</td>
<td>2.784</td>
</tr>
<tr>
<td>180s</td>
<td>4.176</td>
</tr>
<tr>
<td>300s</td>
<td>6.960</td>
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<tr>
<td>600s</td>
<td>13.920</td>
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</tbody>
</table>
Radical activity 3 weeks later

- TTO
- TTO+BHT
- TTO+StoppOx
- Placebo

rel. amount free radicals vs. UV irradiation time, min
New solutions

<table>
<thead>
<tr>
<th></th>
<th>Antioxidative Power AP (AU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tea tree oil</td>
<td>0</td>
</tr>
<tr>
<td>Tea tree oil + 1% BHT Lxg.</td>
<td>3</td>
</tr>
<tr>
<td>Tea tree oil + 2% StoppOx® Lsg.</td>
<td>278</td>
</tr>
</tbody>
</table>
Absorption of StoppOx compared to common UV filters

- OMC
- BP-3
- StoppOx

Filtered zone

Unfiltered zone

Wavelength (nm)

Absorbance

250 270 290 310 330 350 370 390 400
Increase of BBD

e.g. Linseed oil 3 months with StoppOx Lipid 1%
e.g. Almond oil 12 months StoppOx Lipid 1%
Much more studies for product protection are in process at the moment.
Humulone from Hop
Ethyl Ferulate made from rice
Special effective mixture of tocopherols taken from sunflower
Synergistic Approach
StoppOx Lipid → Oil based liquid
StoppOx Fragrance → Ethanol based liquid
StoppOx Emulsion → Dry Oil powder
Recommended usage concentrations:

**StoppOx** Lipid: 1-2% in Native Oils
**StoppOx** Fragrance: 1-2% in Fragrance
**StoppOx** Emulsion: 1-2%

Please ask for support! Each case is individual.
• The blend will match most national and international natural certifying body requirements of natural cosmetics.
• The blend is sustainable as all compounds are derived from nature.
• The product is safe regarding several in vitro and in vivo safety testing.
• vegan
This is not the final oxidation solution for all times but a sustainable, ecofriendly, sophisticated scientific state of the art solution.
Take home

• Protects your product from formation of oxidative irritants like peroxides and formation of oxidative allergens formation
• Protects your active compounds
• Increases the BBD
• Anti Aging and Suncare benefits
• Sustainable, natural and safe antioxidant with very good performance
Thank you for your attention

Visit our booth stand RR89

www.aot.de