# *a proposal of indoor air quality improvement*


Textile auxiliaries

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# The „*Sick-House*“-Syndrome

The so-called „Sick-House“-Syndrome is caused by

**Formaldehyde**

volatilizing from plywood, compiled wood, etc.
used for furniture  wallboard....

**organic solvents**

such as Toluene, Xylene and different alcoholes
volatilizing from paint, adhesives for wallpaper....

**insecticide, germicide, agricultural chemical....**

# Airborne concentration standard of Formaldehyde indoors

| Country / Organization | Concentration (ppm) | Remarks |
|---|---|---|
| WHO | 0,08 | Guidline |
| Germany | 0,10 | Advice |
| State of California (U.S.A.) | 0,05 | Advice |
| State of Wisconsin (U.S.A.) | 0,20 | Standard |
| Canada | 0,05 | Guidline (objective) |
| | 0,10 | Guidline (action) |
| Austria | 0,08 | Advice |
| Netherlands | 0,10 | Standard (Max.) |
| Sweden | 0,10 | Advice |
| Danmark | 0,12 | Advice |
| Finland | 0,13 | Guidline |
| Australia | 0,10 | Guidline |
| Japan | 0,08 | Guidline |

# Airborne Concentration of Formaldehyde and the Effect on human body


| Airborne concentration | Effect on human body |
|---|---|
| 0,03 ppm | cause no irritation of eye, nose or throat |
| abt. 0,05 ppm | smell odor |
| 0,05 - 0,45 ppm | start irritation of eye |
| abt. 0,5 ppm | feel unpleasant caused by odor |
| 2-3 ppm | cause more irritation of nose and eye |
| 4-5 ppm | watery eye may occur |
| 50-100 ppm | cause sudden poisoning after exposure of 5 to 10 minutes |

# The TRIPLE FRESH treatment

**1. FormFresh** deodorant for formaldehyde

**2. CigarFresh** deodorant for cigarette smoke
- Nicotine
- Acetaldehyde
- Acetic Acid

**3. OdorFresh** deodorant for four major malodorous substances
- Ammonia
- Trimethlyamine
- Hydrogen sulfide
- Methyl mercaptan

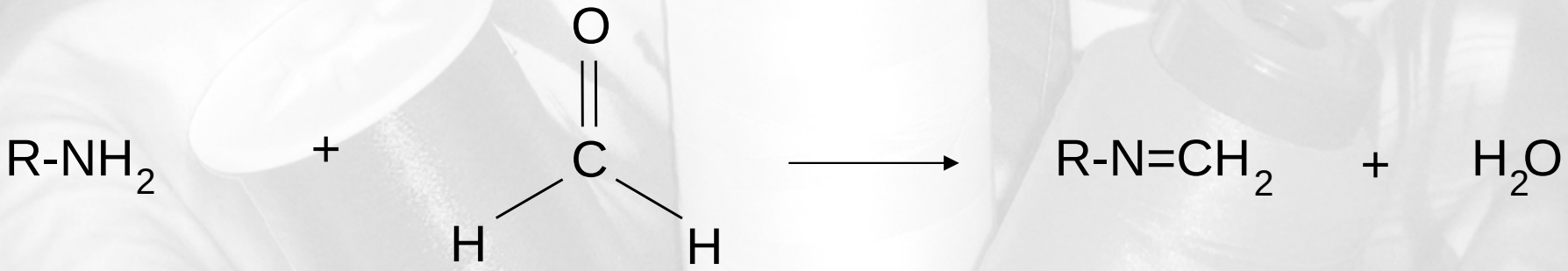
# 1. FormFresh

## Deodorant (Absorption and decomposition) for formaldehyde

**a.) Chemical reaction mechanism**
**with organic nitrogen compound**

**b.) Chemical absorption & decomposition mechanism**
**with some kinds of metallic salt**

# a.) Chemical reaction mechanism with organic nitrogen compound




organic nitrogen compound A

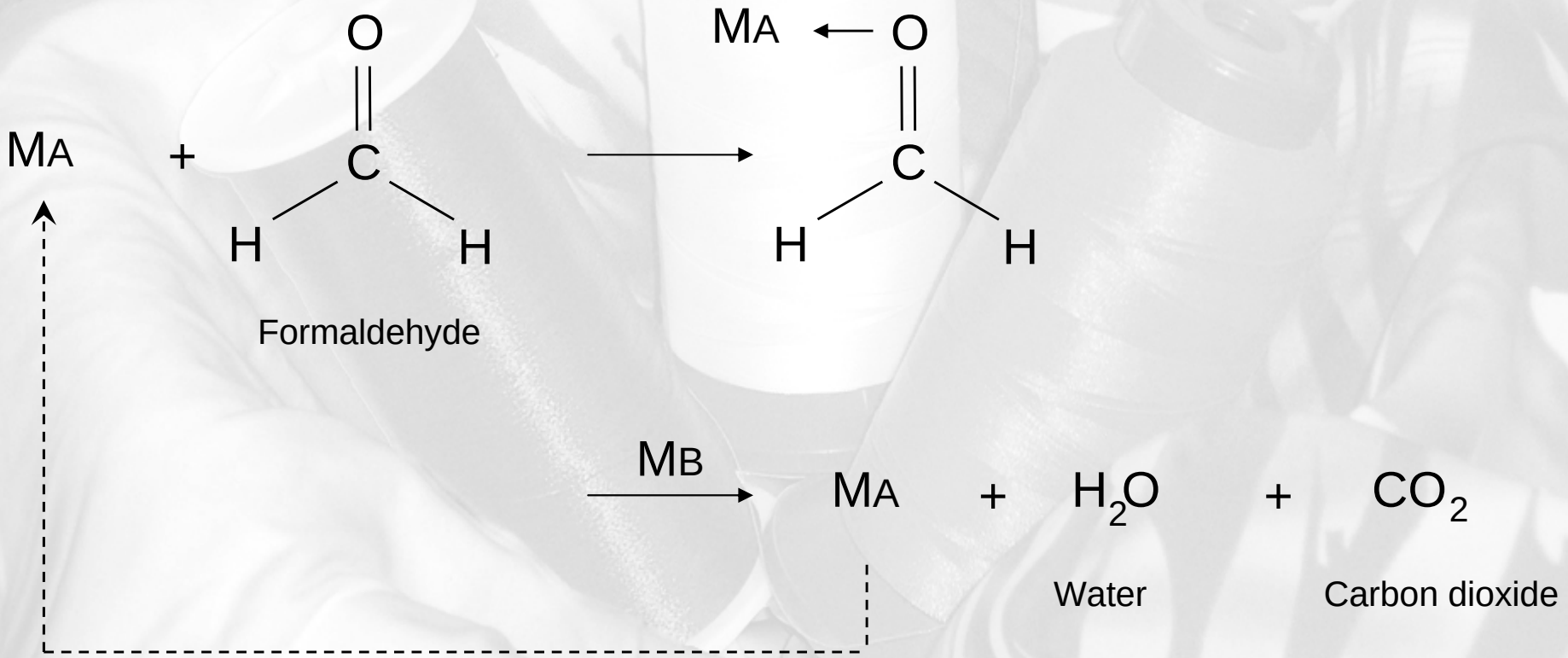
Formaldehyde

organic nitrogen compound B

Water

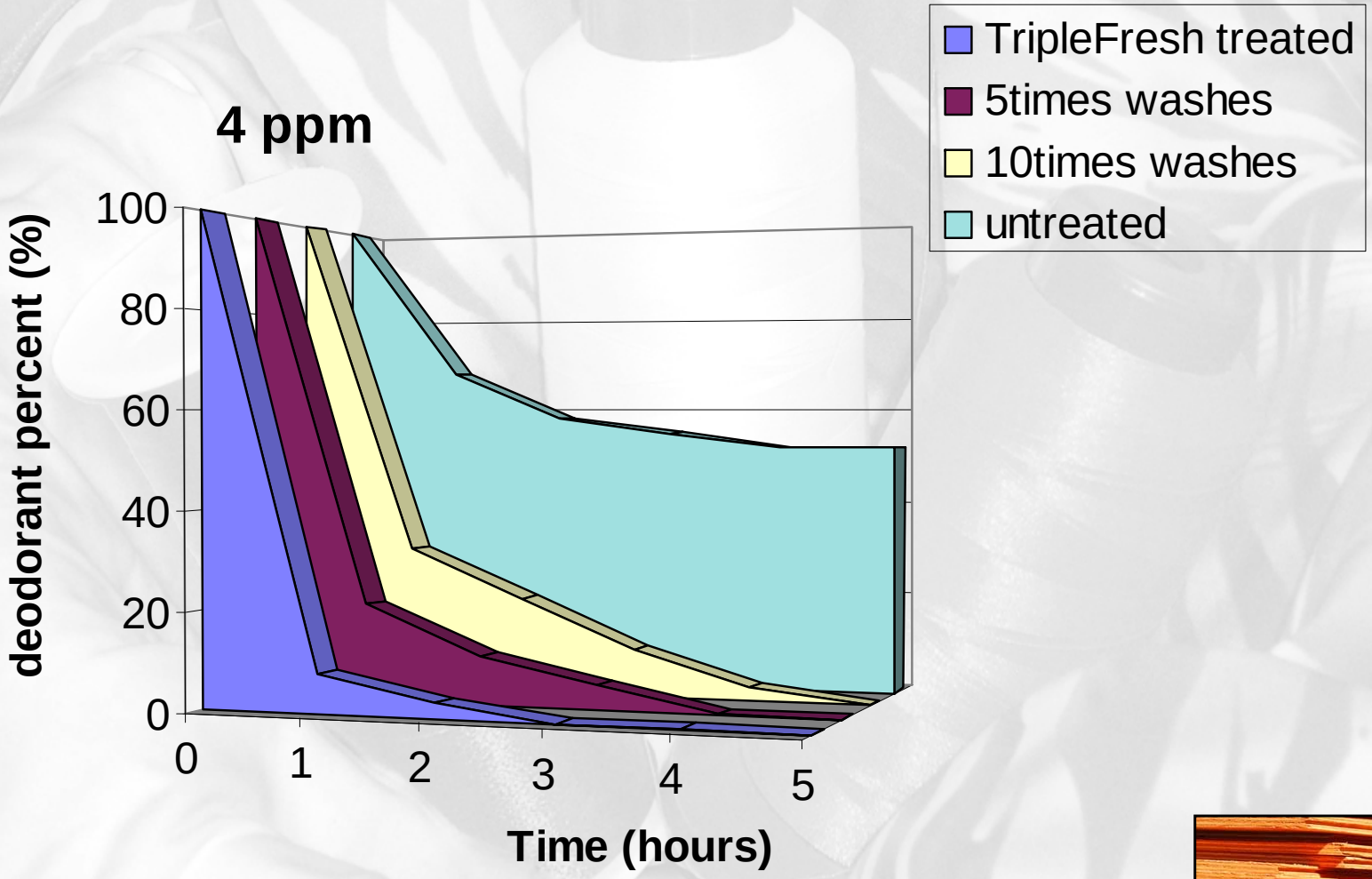
# b.) Chemical absorption & decomposition mechanism with some kinds of metallic salt

$M_A$,$M_B$: Metallic salt

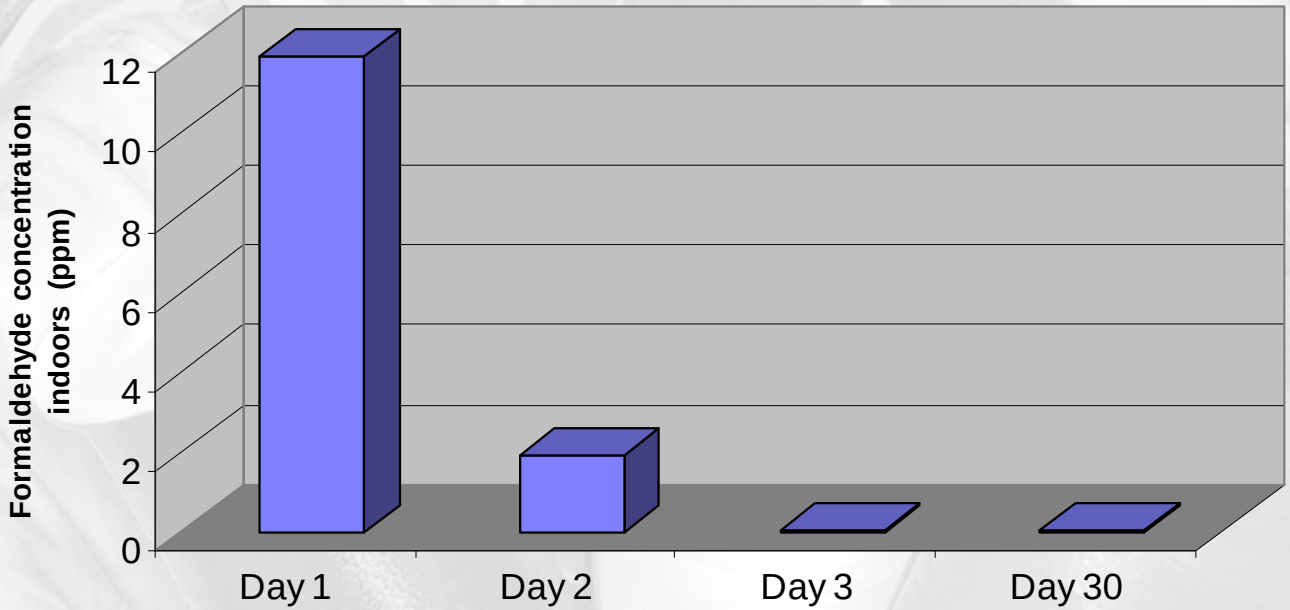



Reaction rate: 1 g Triple Fresh can decompose ab. 12 mg Formaldehyde per hour.

# Effect confirmation test for Formaldehyde




# Effect confirmation test for Formaldehyde




| Day of measurement | Formaldehyde concentration indoors |
|---|---|
| Day 1 | 11,9 ppm |
| Day 2 | 1,9 ppm |
| Day 3 | n.d. |
| Day 30 | 0.02 ppm |

# Capacity of TRIPLE FRESH:

**3 m² [3.6 yd²] of TRIPLE FRESH treated carpet
is sufficient for 9 m² [10,8 yd²] room with 220 kg [485 lb] plywood.**

**Example calculation:**

**Quantity of plywood used in 9 m² room = 220 kg**

**Quantity of formaldehyde contained in general lauan plywood = 0.002 mg/g**

**Possible total quantity of formaldehyde generating from lauan plywood
= 220 kg x 0.002 mg/g = 440 mg**

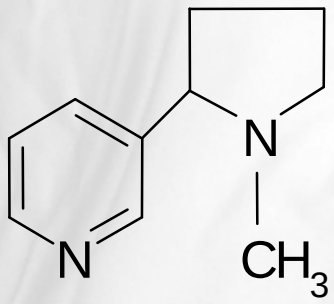
**Absorption capacity of formaldehyde per 3 m² = 660 mg
(only chemical reaction mechanism! Carpet was treated with 20 g/m² [0.6 oz/yd²]
TRIPLE FRESH)**

## 2. CigarFresh

### Deodorant (absorption and decomposition) for cigarette smoke

**The smoke of a cigarette contains more than 4.000 different chemical substances. Most of them are:**

- **Nicotine**
- **Acetaldehyde**
- **Acetic acid**

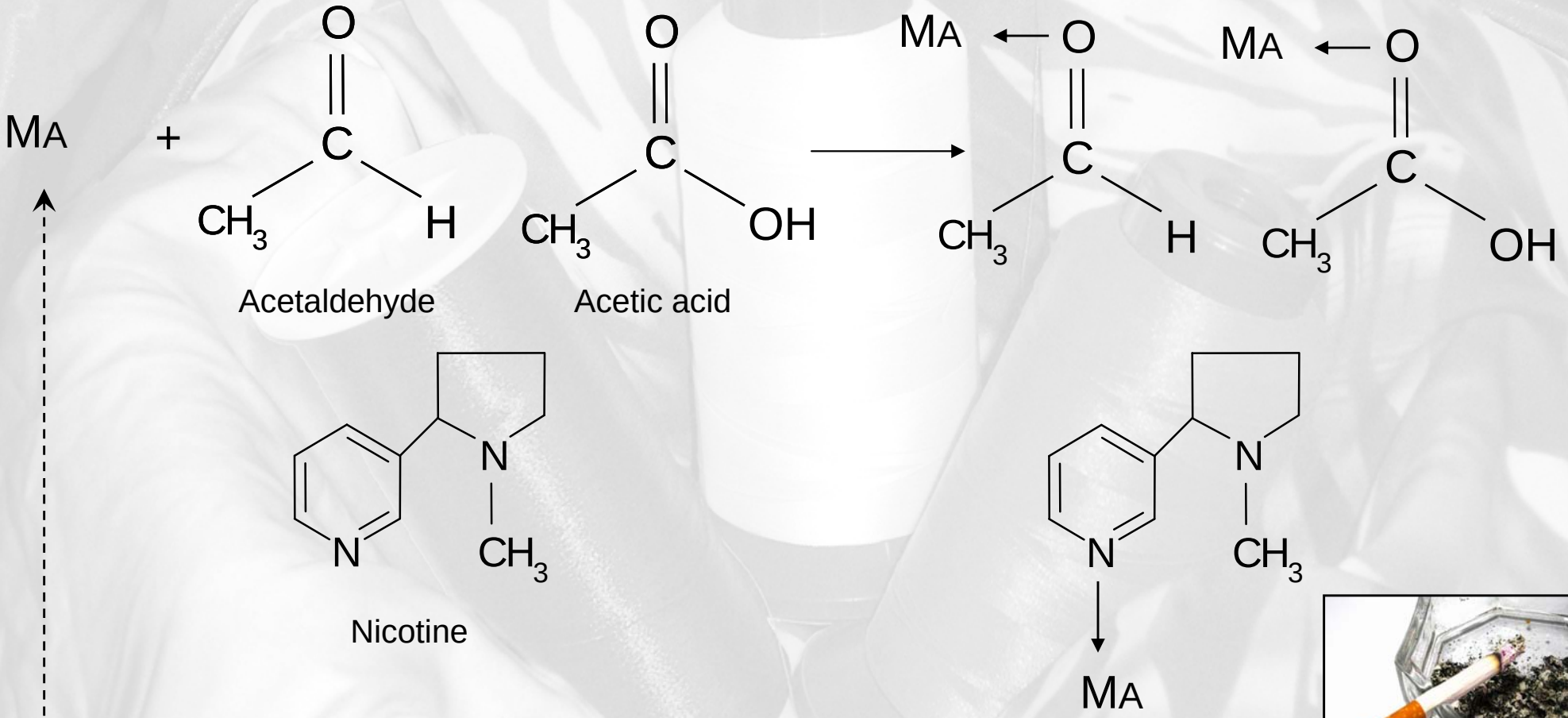


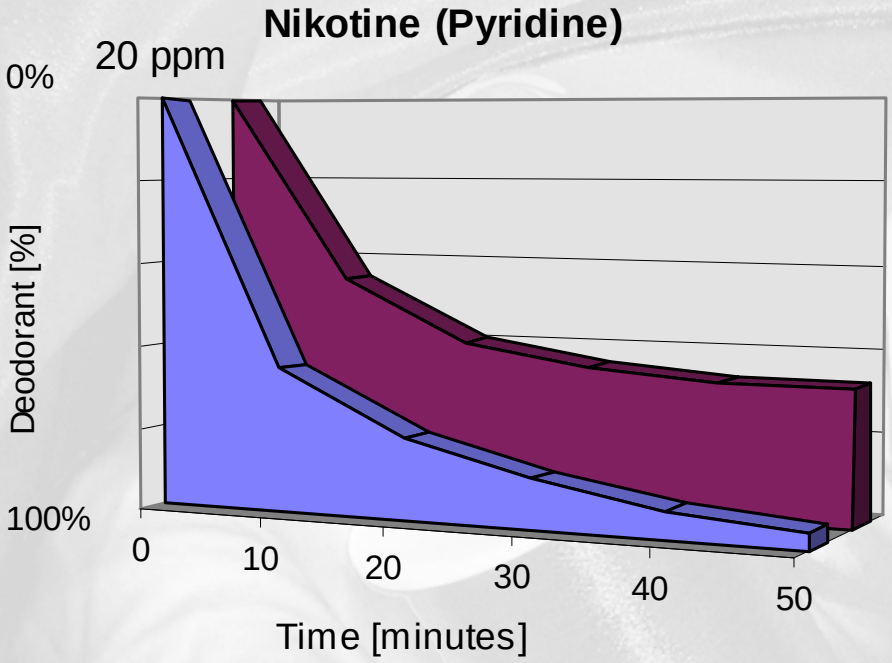

# Major components contained in cigarette smoke

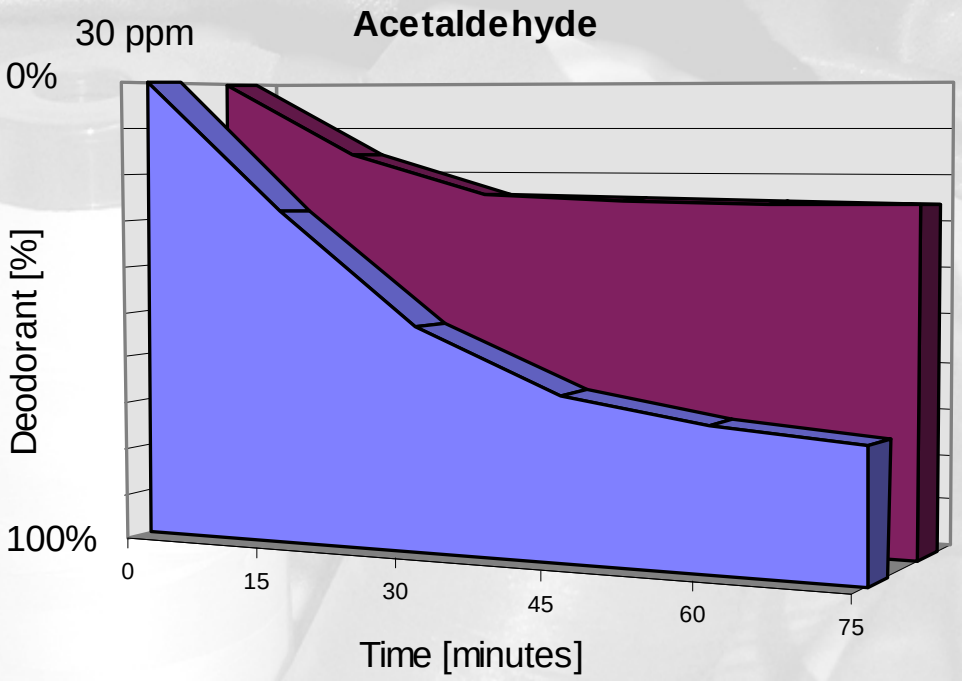
| Component material | Quantity (µg) in one cigarette |
|---|---|
| Nicotine | 100 - 2,000 |
| Aldehyde | 60 - 1,630 |
| Acetic aicd | 500 - 1,000 |
| Hydrogen cyanid | 30 - 200 |
| Phenol | 10 - 200 |
| Ammonia | 10 - 150 |
| Cresol | 10 - 150 |
| Hydrogen sulfide | 25 - 110 |
| Pyridine | 9 - 93 |

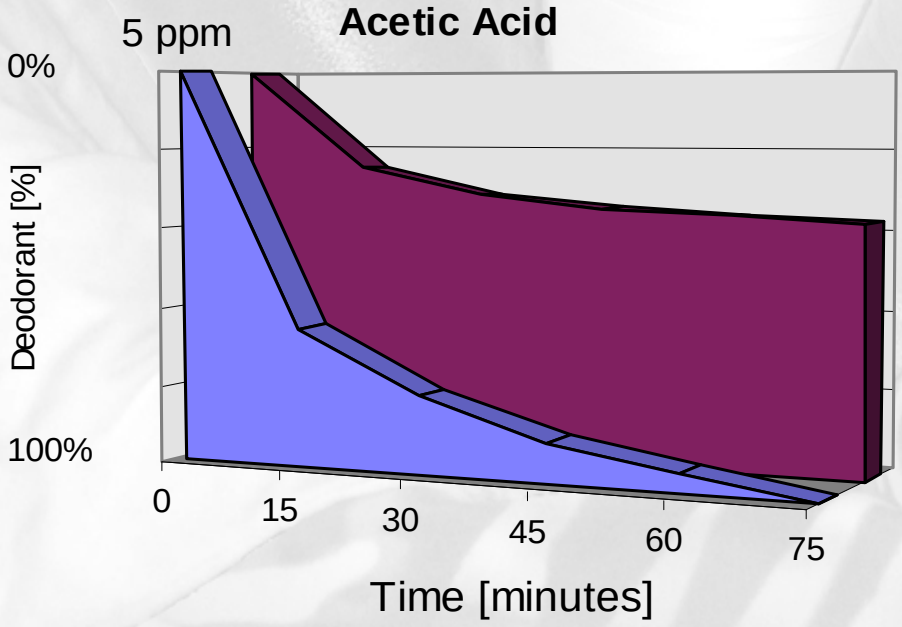
# CigarFresh deodorant mechanism

MA,MB: Metallic salt



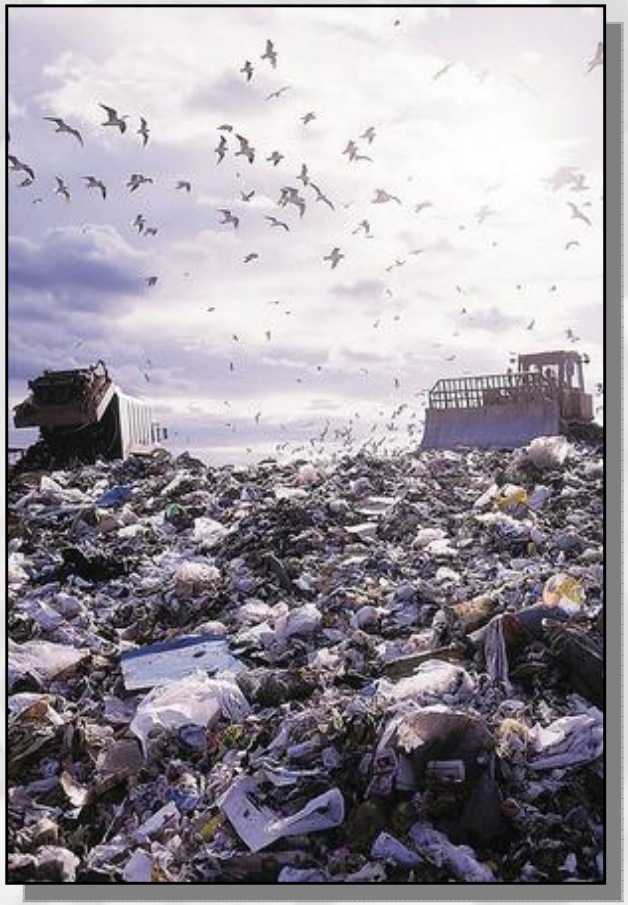

**Triple Fresh**

**untreated**

# 3. OdorFresh

## Deodorant (absorption and decomposition) for four major malodorous substances

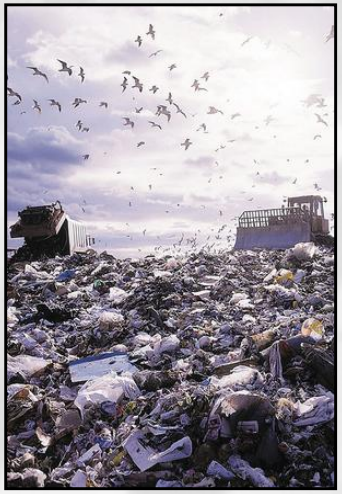
- **Ammonia**
- **Trimethylamine**
- **Hydrogen sulfide**
- **Methyl mercaptan**



## 3. OdorFresh

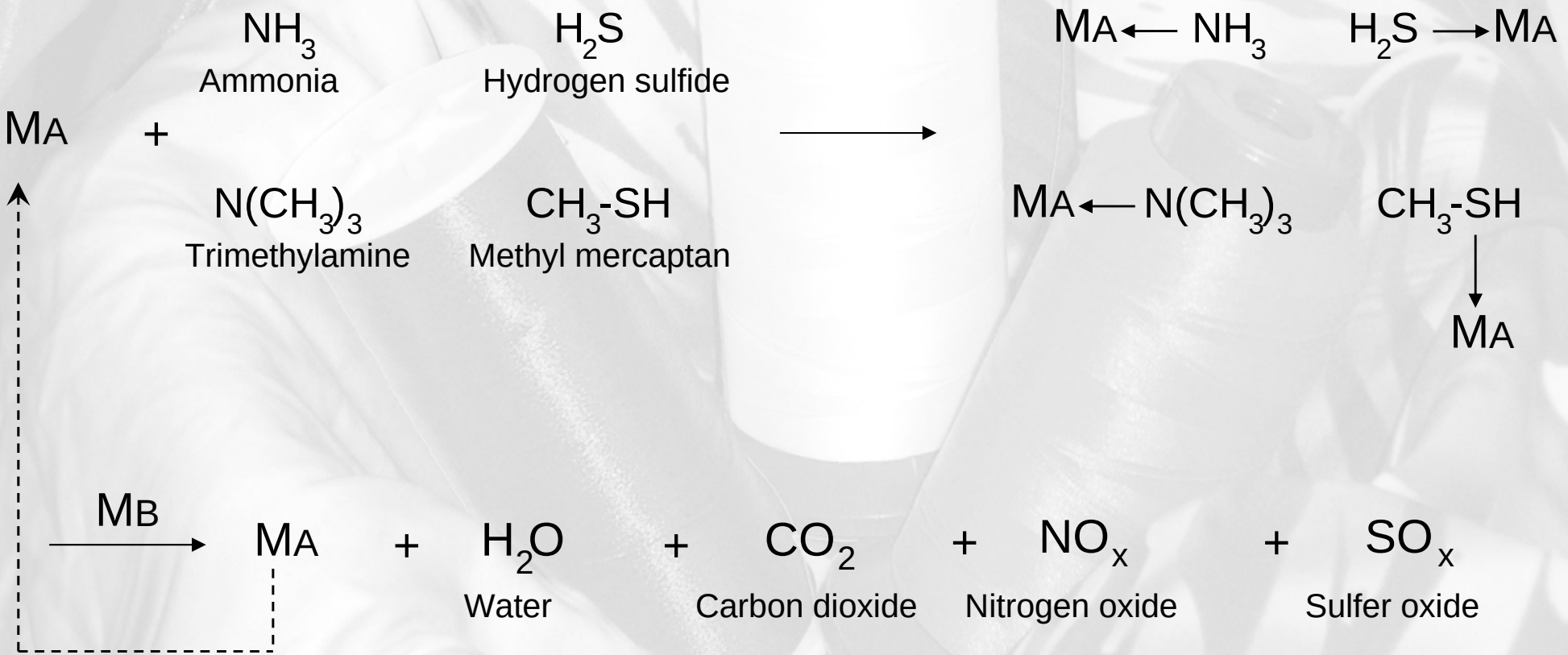
### Four major malodorous substances and sources of generation

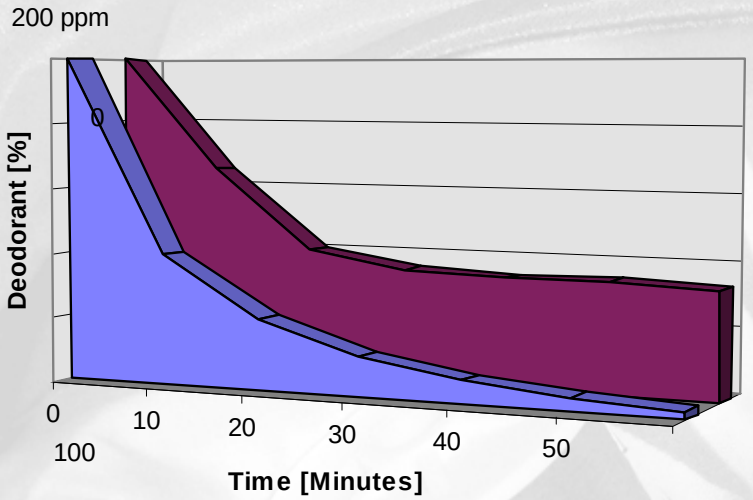
| Substance | Smell | Source of generation |
|---|---|---|
| Ammonia | smell like feces | feces, sweat |
| Trimethylamine | smell like rotten fish | rotten fish, sweat |
| Hydrogen Sulfide | smell like rotten egg | rotten egg, feces, foul breadth, kitchen refuse |
| Methyl mercaptan | smell like rotten onion | rotten onion, feces, foul breadth, kichen refuse |



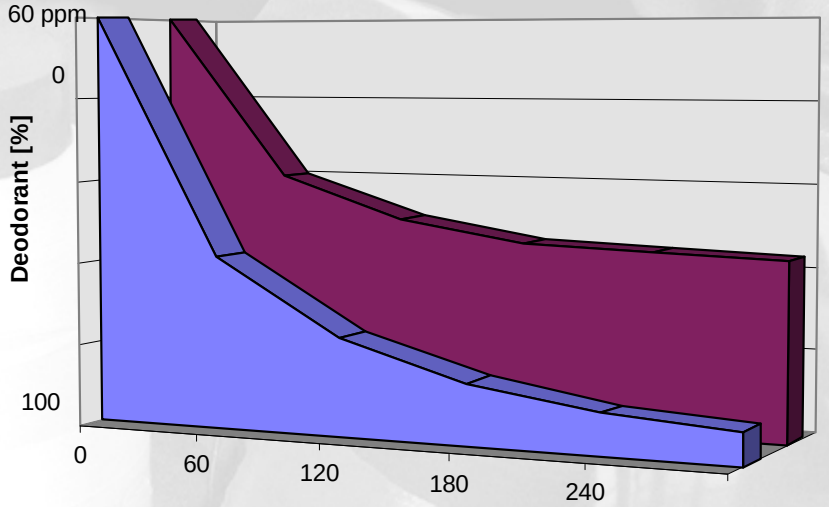
# OdorFresh deodorant mechanism

MA,MB: Metallic salt

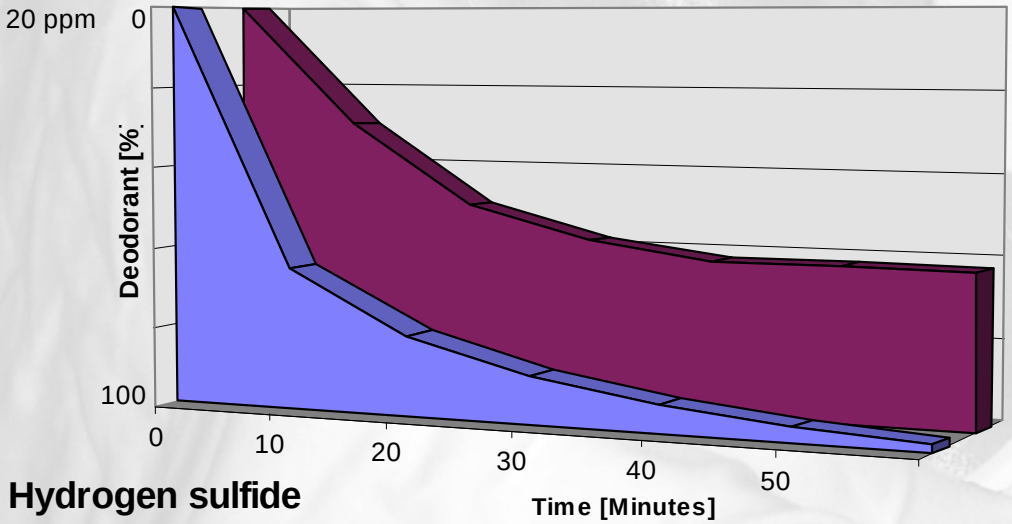


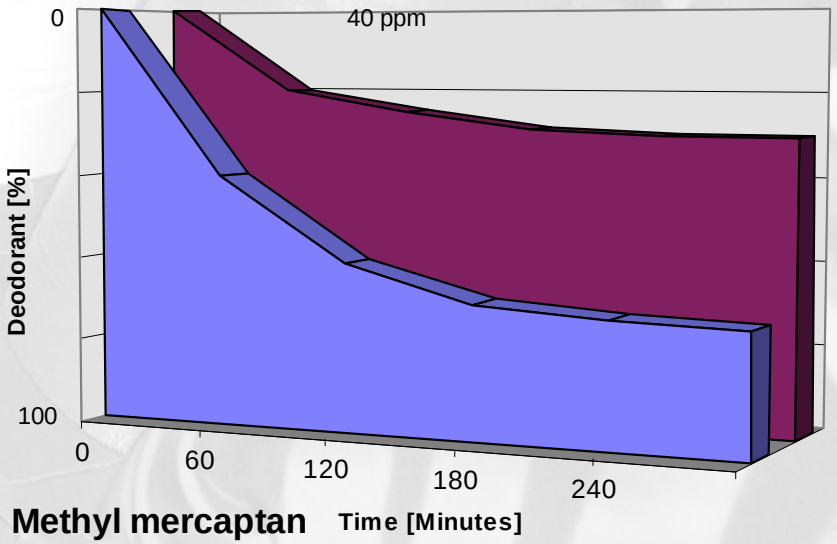

**Ammonia**




**Trimetyhlamine**




**Hydrogen sulfide**

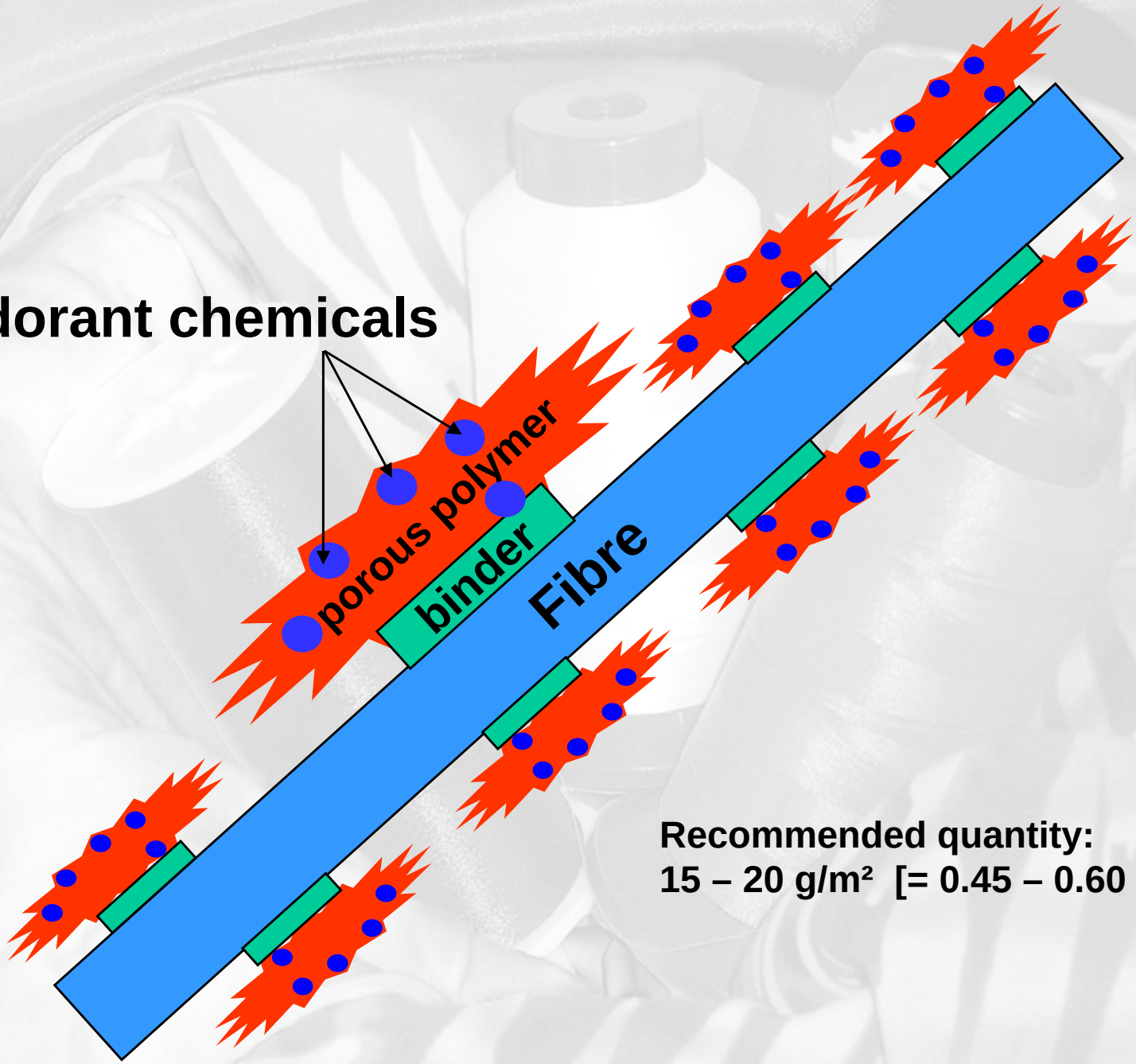



**Methyl mercaptan**


## Experience in practice

## Applications

## Customer references




**Recommended quantity:**
**15 – 20 g/m² [= 0.45 – 0.60 oz/yd²]**

# TRIPLE FRESH in sun-blinds

The first big customer we found was

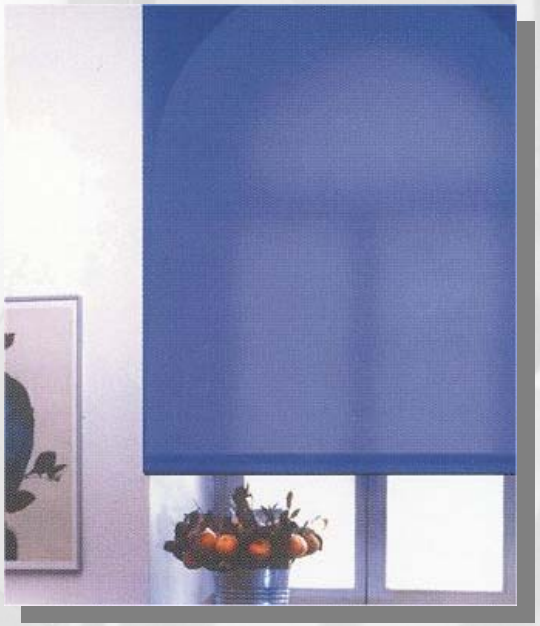
Bamberger
Kaliko

# TRIPLE FRESH in sun-blinds

The Bamberger Kaliko is a manufacturer of TRIPLE FRESH treated roller blinds and lamella fabrics for indoors sun protection.
From this fabrics e.g.

- Curtains
- Roller blinds
- Horizontal-blinds
- Lamella curtains
- Pleat and folded curtains

are produced.



# TRIPLE FRESH in sun-blinds

The brand name of TRIPLE FRESH treated fabrics made by Bamberger Kaliko is

**BaKaSave®**

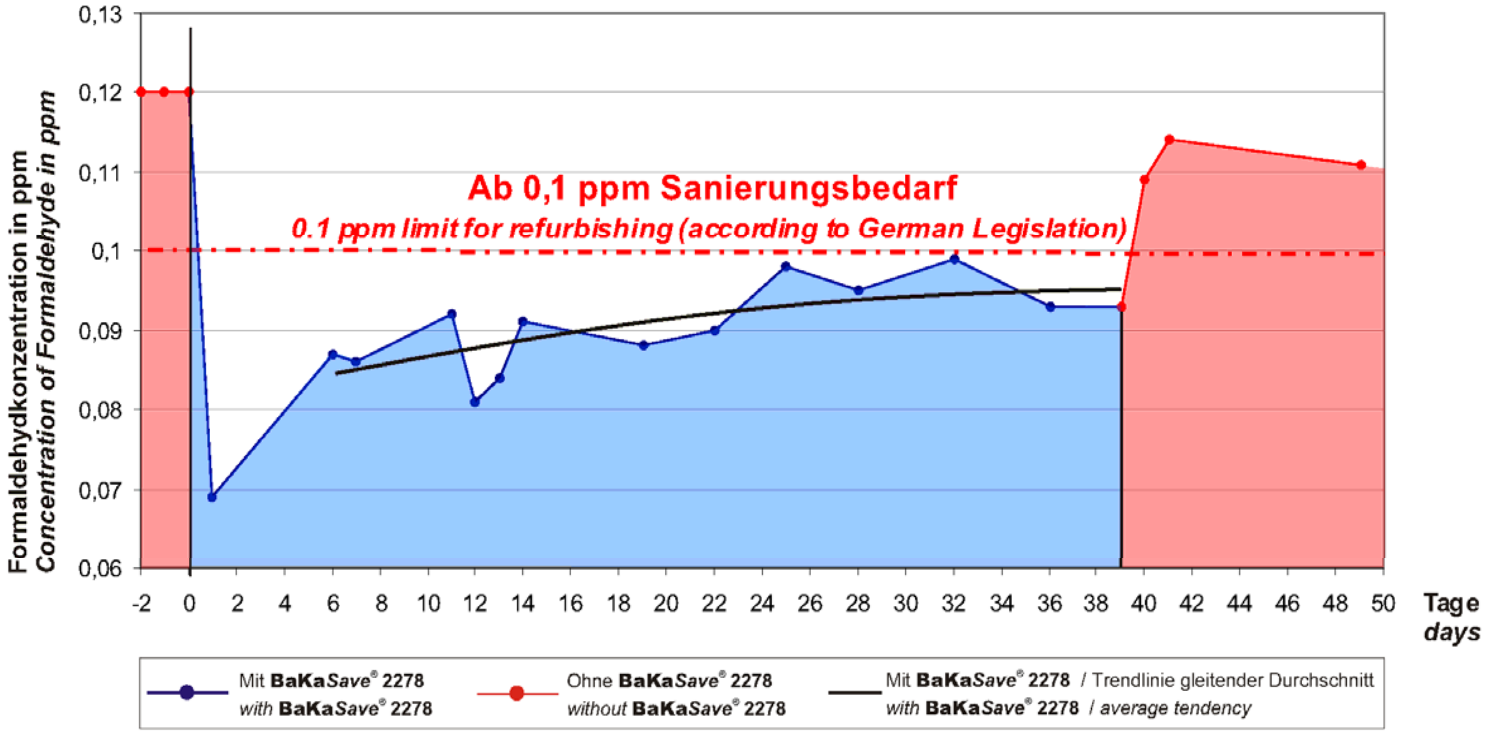
# TRIPLE FRESH in sun-blinds

LGA Landesgewerbeanstalt Bayern

Bamberger Kaliko

**Abnahme der Formaldehydkonzentration in einer Prüfkammer, durch Zugabe von BaKaSave® 2278**
***Reduction of the Formaldehyde Concentration in a Test Chamber by Adding BaKaSave® 2278***

Formaldehydquelle: handelsübliche Spanplatte (Raumbeladung 1,5 m² / m³)
Formaldehyde source: standard type woodchip board (1,5 m² / m³)




Untersuchungen und Beratung: Landesgewerbeanstalt Bayern LGA
*testing and consulting by: Landesgewerbeanstalt Bayern LGA*

LGA

07/2002

# TRIPLE FRESH in carpets

dura® + TRIPLE FRESH® ⟶ duraAir®

The biggest German producer of tufted carpets, "Dura Tufting GmbH" in Fulda, has started with a product range of TRIPLE FRESH® carpets under the brand

duraAir®

Other manufacturer of textiles had followed with products containing TRIPLE FRESH®, with the suffix "Air" in the brand name. The idea is to have a mutual benefit and a synergistic effect from marketing activities.

# TRIPLE FRESH in carpets

duraAir®

What is duraAir®? How does it work ? Who needs it ?

## What is duraAir® ?

duraAir® is the first carpet floor covering that wholly or partly converts and decomposes potentially harmful substances in the air such as formaldehyde, nicotine, and unpleasant odours, for example, into uncritical air components like water steam and carbon dioxide.

duraAir® is not an odour absorber, but works by the catalyst priciple so it remains permanently effective and is not gradually used up over time.

duraAir® improves the quality of life in homes, offices and cars by creating more agreeable and healthier room air. The effect of this patented process has been scientifically tested, is harmless to health and therefore especially suited for allergy sufferers.


duraAir®... setting new standards for carpeting

Zertifiziert durch: TÜV

Imprint

more dura products

deutsch english русский svensk

Auch erhältlich bei: Hammer TTM

# TRIPLE FRESH in carpets

duraAir®

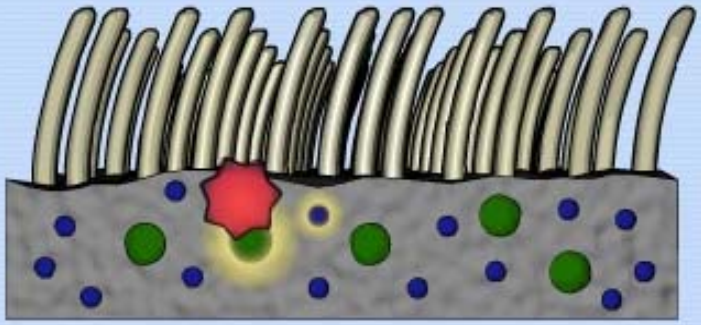
What is duraAir®? How does it work ? Who needs it ?

## How does it work?

The secret of duraAir® is a completely new active agent, which triggers the catalyst reaction, an effect unlimited by time. This active agent is attached to the precoat – the backing of the carpet floor covering. As a result of air circulation, the odour causing or gaseous molecules will come in contact with duraAir® and are transformed and removed immediately. The pollutants are oxidized, predominantly converted to carbon dioxide and water steam, and removed.

Thus, duraAir® effective against room air pollutants and removes unpleasant odours.

GOODBYE ODOUR...



Zertifiziert durch: TÜV

Imprint

more dura products

deutsch english русский svensk

Auch erhältlich bei: Hammer TTM

# TRIPLE FRESH in curtains

progressive | aesthetic | safe **drapilux**

## drapilux air

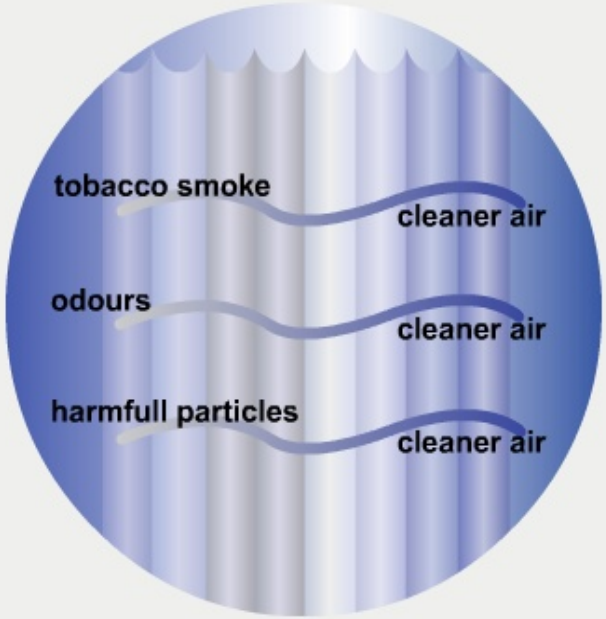
**Effect of drapilux air**

drapilux air uses a catalytic process to transform pollutants, such as nicotine and formaldehyde, as well as other numerous odours into harmless, natural substances. As soon as pollutant or odour molecules come into contact with drapilux air fabrics, a chemical reaction takes place: they are broken down and rendered harmless.

drapilux air works in the same way as a catalytic converter in a car.

**The principle behind the catalytic effect:**
As soon as poisonous exhaust fumes - hydrocarbon and carbon monoxide - come into contact with precious metals platinum, rhodium and palladium in a catalytic converter in a car, a chemical reaction takes place.
The harmful substances are transformed and broken down into completely harmless carbon dioxide ($CO_2$) and vapour ($H_2O$).

Nevertheless, the catalytic effect of drapilux air must not be confused with adsorption, since here harmful substances are merely enclosed by the active agent, and not broken down




air
drapilux®

# TRIPLE FRESH in paints


"Setta" is a brand of the VFG.

VFG is a German federation of medium-sized enterprises doing business with paints, lacquers, wallpapers and floor coverings.

# Relevant websites


| | |
|---|---|
| Suminoe: | http://www.triplefresh.jp |
| BakaSave: | http://www.bakasave.de/en/start.htm |
| DuraAir: | http://www.dura-air.de |
| VFG: | http://www.setta-airactiv.de |
| Drapilux: | http://www.drapilux.com/en/intelligent_fabrics/drapilux-air.php |

# ... and is it really working ... ?

There are a lot of questions to ask if people are dealing with the new way of TRIPLE FRESH treatment. The first and most frequent question of all is a kind of unbelieving and critical: *Is TRIPLE FRESH really working???*

Numerous **objective measurements**
- made by ourselves
- made by Bamberger Kaliko

but also from independent institutes such as
- "Textilinstitut Thüringen-Vogtland (TITV)" in Greiz, Saxonia or
- the "Landesgewerbeanstalt Bayern (LGA)" in Nuremberg, Bavaria
- "Institut für Umwelt und Gesundheit (IUG)" in Fulda
- "Institut für Umweltschutz und Agrikulturchemie (IUA)" in Velbert

as well as a lot of **subjective impressions** have confirmed the effect of TRIPLE FRESH!

# Scientific proof

Report of the German Institute for Environment and health.

## INSTITUT FÜR UMWELT UND GESUNDHEIT - IUG

### PRÜFBERICHT

| | |
|---|---|
| **Auftraggeber:** | Zschimmer & Schwarz (Herr Nilles) |
| **Gutachter:** | Prof. Dr. habil. Friedhelm Diel (Dipl.-Ing.)<br>Dr. Michael Fischer (Dipl.-Chem.) |
| **Qualitätssicherung:** | INSTITUT FÜR UMWELT UND GESUNDHEIT - IUG Fulda<br>und FB:Oe, FH Fulda, H. Borck (LM-Chemikerin) |
| **Bearbeitungzeitraum:** | Frühjahr 2003 |

**Ziel der Untersuchung** ist die Klärung der Frage:

Kann „Triple Fresh (TF)“ Formaldehyd katalytisch zu Kohlendioxid ($CO_2$) und Wasser abbauen? Hier: Anwendung „diskontinuierlicher“ und „kontinuierlicher Verfahren“ einer zeit- und kostengünstigen Prüfmethode für TF-Produkte.

**Zusammenfassung:**

**Mit den vorliegenden Untersuchungen kann bestätigt werden, dass „Triple Fresh (TF)“ der Firma Zschimmer & Schwarz Formaldehyd (HCHO) zu Kohlendioxid ($CO_2$) abzubauen vermag. Bei dieser Reaktion handelt es sich um eine heterogene oxidative Katalyse. Aufgrund der technisch schwierigen $CO_2$-Nachweise – am Institut für Umwelt und Gesundheit (IUG): turbidimetrisch, acidimetrisch, mittels $CO_2$-sensitiver Elektrode und mit dem IR-Gasanalysator – wird lediglich das „diskontinuierliche Verfahren“ erfolgreich durchgeführt. Die vorgeschlagene einfache Versuchsanordnung kann auch für andere TF-Reaktivität bzw. Produktprüfu0ngen heran gezogen werden.**

# Scientific proof - Report on nicotine

No. 9

THE CITY OF OSAKA
CITY HALL
OSAKA, JAPAN

OSAKA CITY INSTITUTE OF PUBLIC HEALTH
AND ENVIRONMENTAL SCIENCES
8-34 Tojo-cho, Tennoji-ku, Osaka 543, Japan

REPORT ON THE EXAMINATION

Certificate No.TAIKI 15-17
Applicant
Name : SUMINOE TEXTILE CO., LTD
Address : 11-20, 3-Chome, Minami-Senba, Chuo-ku, Osaka 542-8504, Japan

Article
" Triple Fresh "
Subject
CO2 CONCENTRATION

Data received
May 15, 2003
Data issued
June 2, 2003 English translations : June 16, 2003

We tested the CO2 concentration on the sample presented to our laboratory and obtained the following results as stated in the attached papers.

Signature Hideo Nakazawa
NAKAZAWA, M.D.
Director of
Osaka City Institute of
Public Health and
Environmental Sciences

THE CITY OF OSAKA
CITY HALL, OSAKA, JAPAN

TEST REPORT

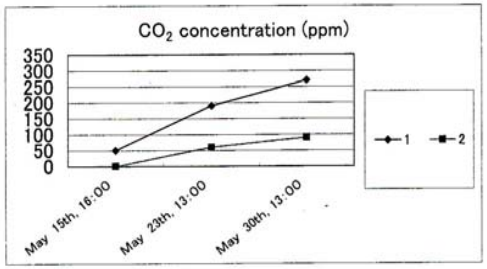
Subject : $CO_2$ concentration

Material : 1) Triple Fresh
2) Blank

Test method : IR method

Result :

| | | | 1 | 2 |
|---|---|---|---|---|
| $CO_2$ concentration (ppm) | 0days | Measured on May 15th, 16:00 | 50 | 0 |
| | 8days later | Measured on May 23th, 13:00 | 190 | 60 |
| | 15days later | Measured on May 30th, 13:00 | 270 | 90 |

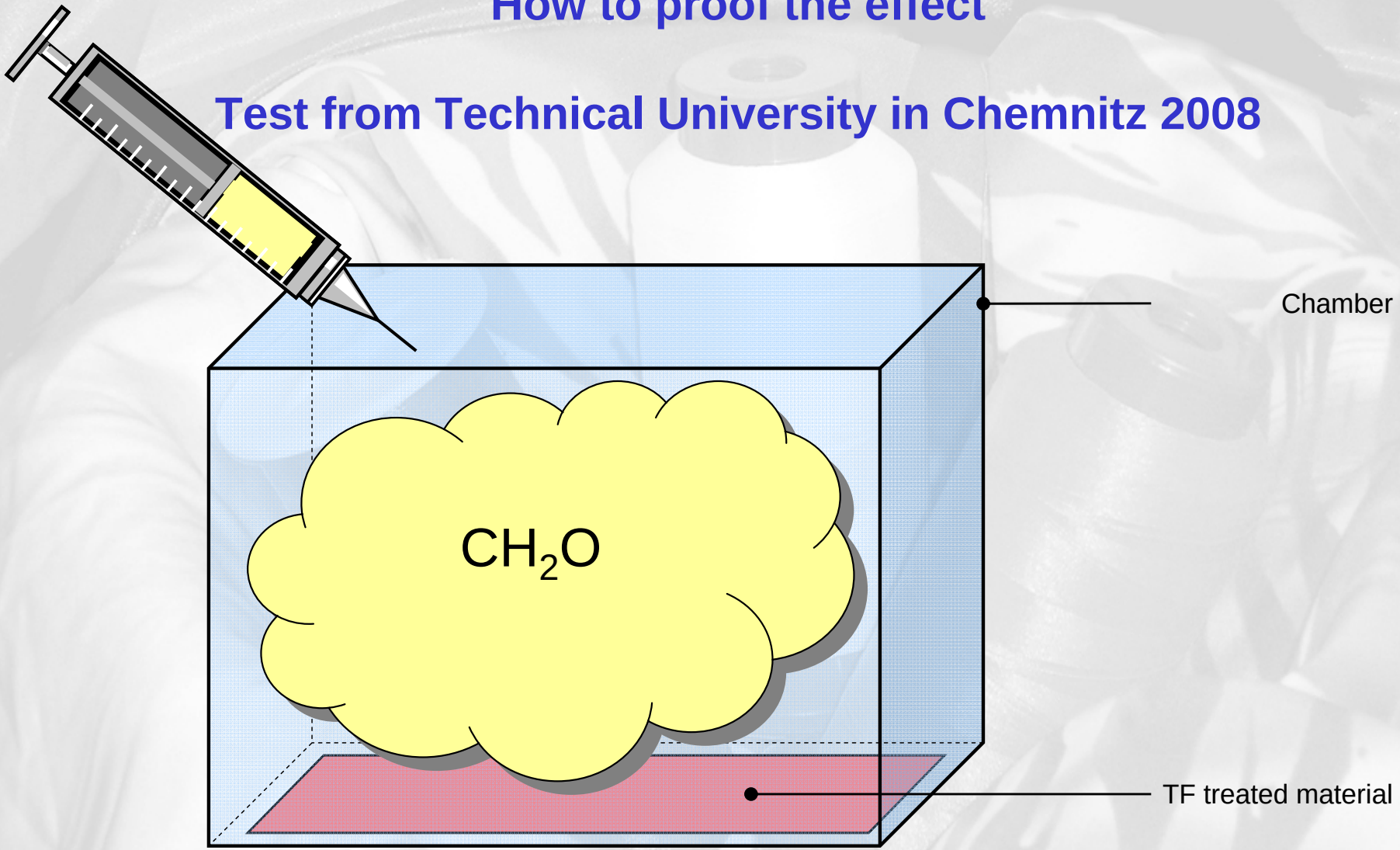



Note:

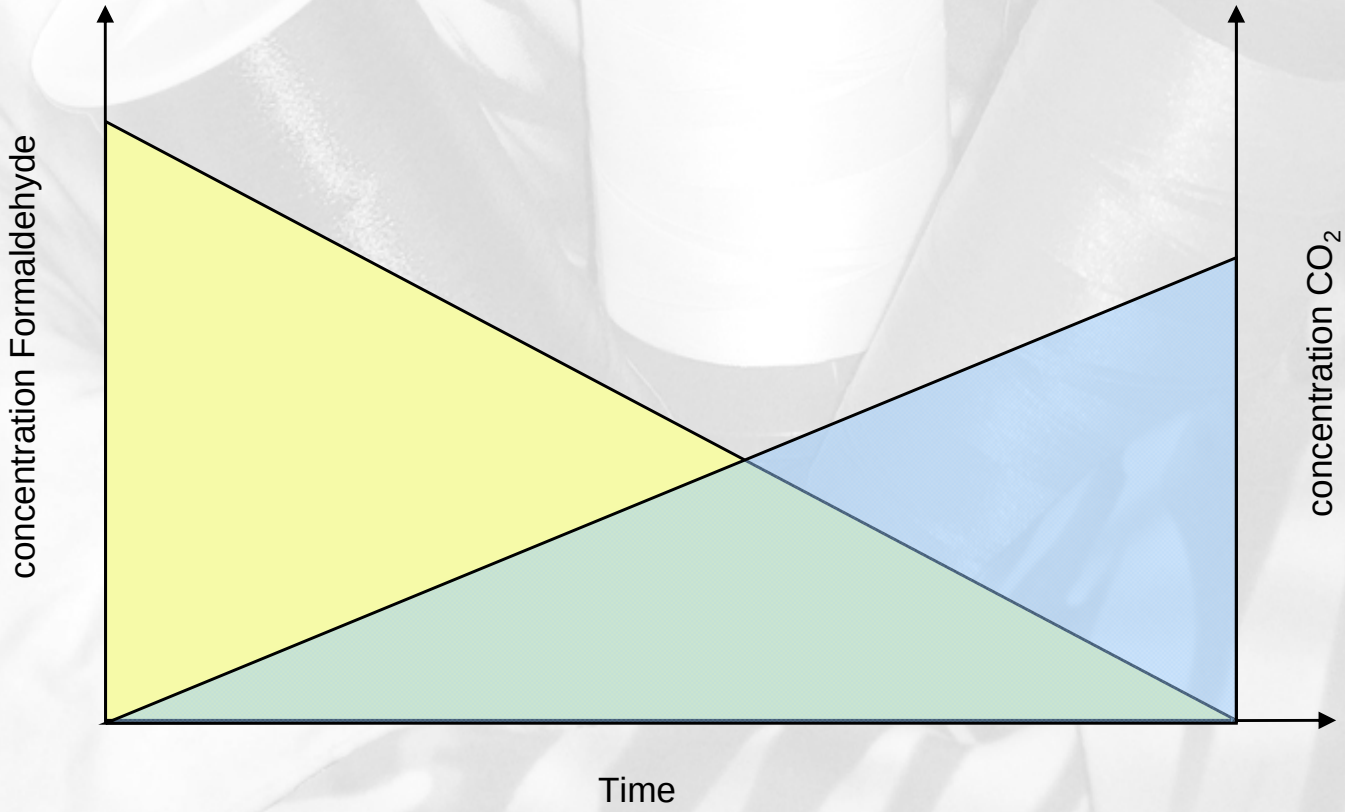
| | | |
|---|---|---|
| Material | 1. Triple Fresh<br>3.0g of Triple Fresh Powder<br>4.5μl of nicotine | 2. Blank<br>----- |
| Container | 3 litter tedler bag | |
| Air filled in container | "Pure Air G1" 3 litter | |
| $CO_2$ measurement | IR method $CO_2$ instrument (Fuji Electric) | |
| Test condition | Temperature 20deg. C. Humidity 50% | |

# How to proof the effect

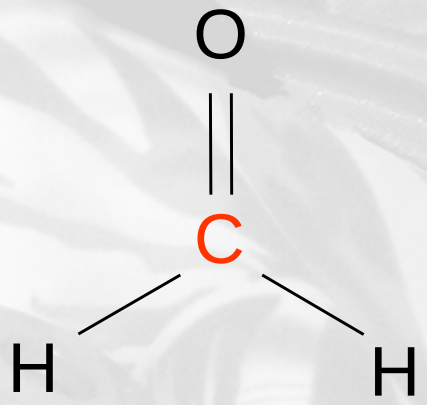
## Test from Technical University in Chemnitz 2008



# How to proof the effect

# How to proof the effect




⇨ Some people may say: Nice absorber!

We show them the increasing amount of $CO_2$.

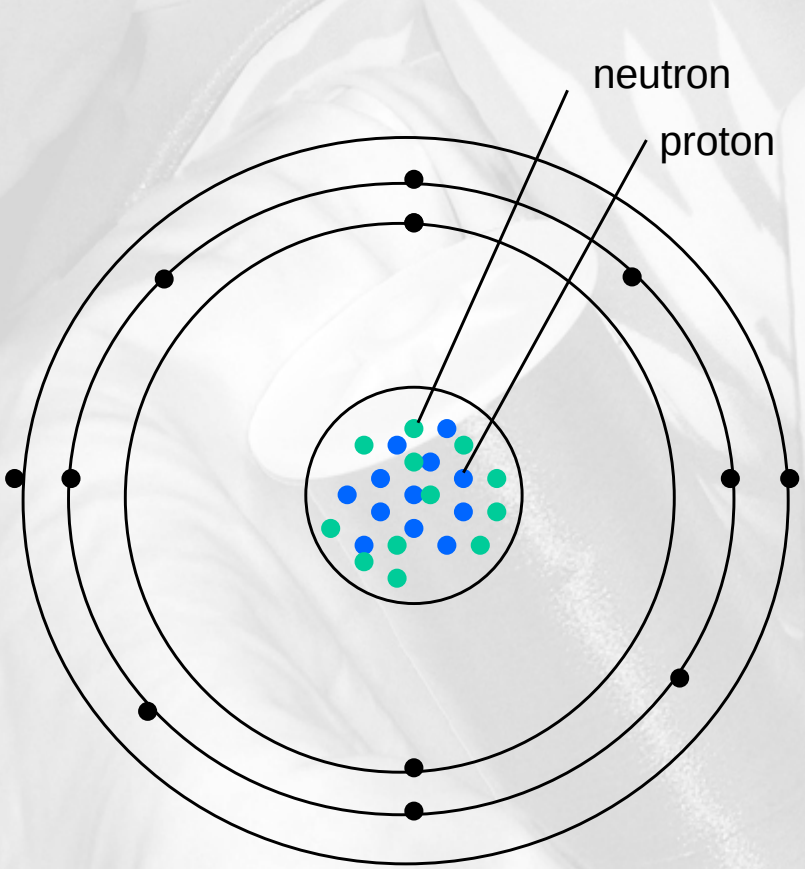
⇨ Then they say: There was a leakage in the experiment….

So we had to find a way to show that the $CO_2$ is not coming from another source than catalytic Triple Fresh effect! So we have to mark the carbon atom in the formaldehyde….

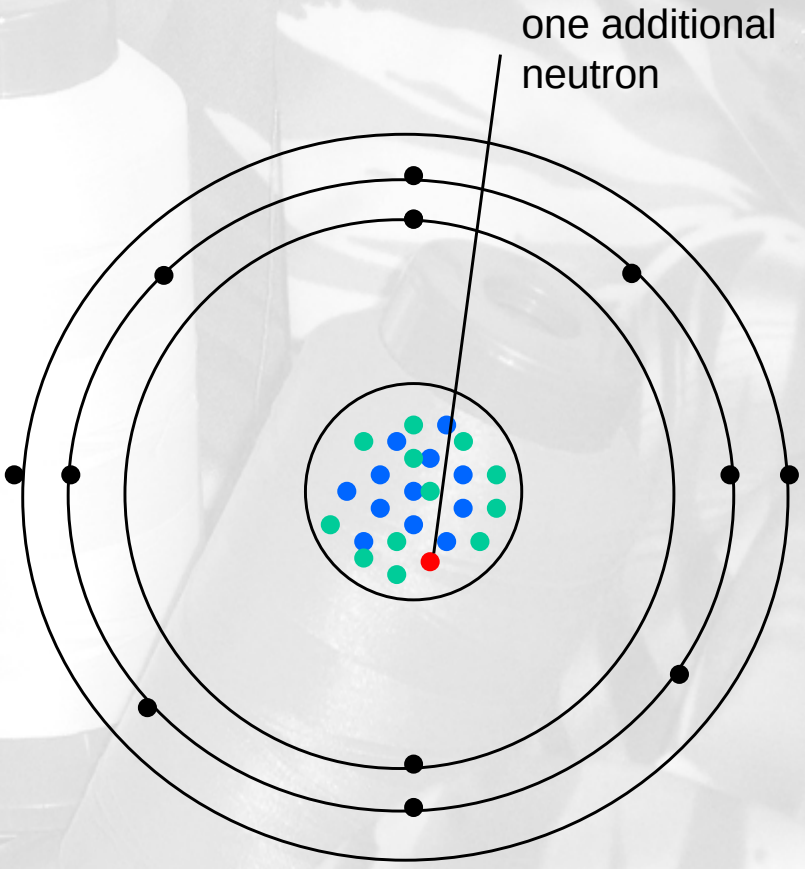
But how to mark a atom???

**With the carbon isotope $^{13}C$!**

# How to proof the effect

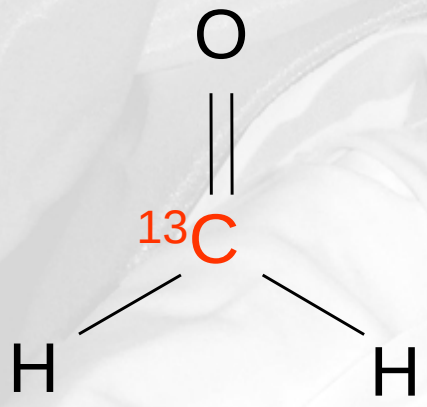



$^{12}C$ Carbon




$^{13}C$ Carbon

# How to proof the effect




At Sigma-Aldrich Formaldehyde is available were the central Carbon is $^{13}C$.

Order number 489417: Formaldehyde-$^{13}C$ solution 20 wt. % in water, 99 atom %. $^{13}C$ (price for 1 g is 270 EUR)

# How to proof the effect