

Chemical substances in newly constructed showcases



Fraunhofer **Wilhelm-Klauditz-Institut**
Material Analysis
and Indoor Chemistry

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Artefacts stored in cases

Typical damages on molluscs („bynes disease“)

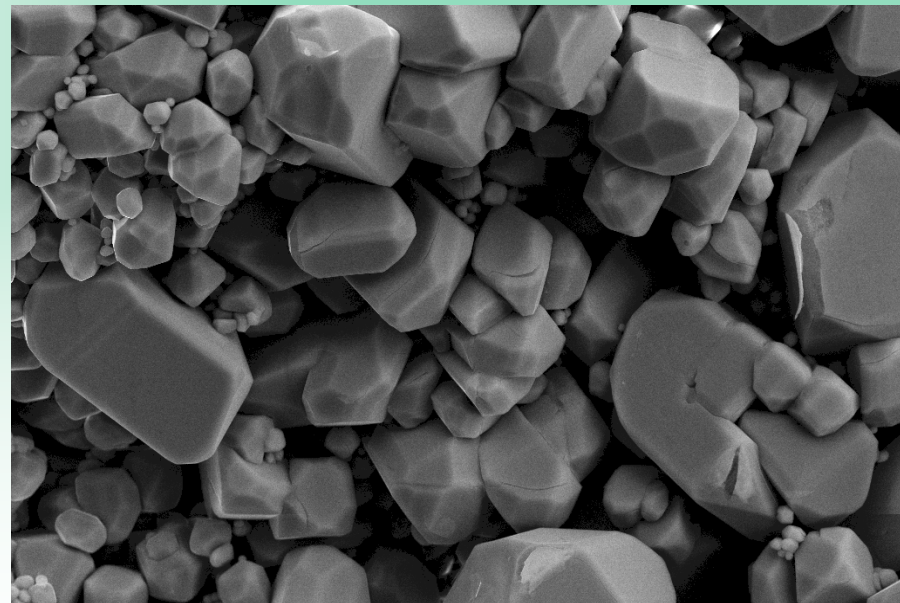
and on metals

due to acidic emissions of construction materials

We learned from it...



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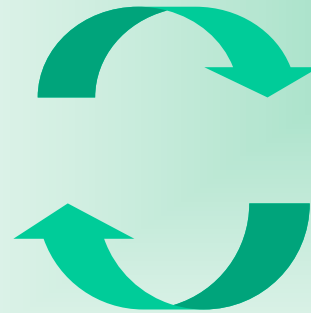
Mag = 1.68 K X 10µm EHT = 15.00 kV WD = 11 mm File Name = PbForm_02.tif
Fraunhofer-IST Aperture Size = 30.00 µm User Name = SCHIFFMANN
Detector = SE2 Date :22 May 2006 Time :13:23:32

Substitution of well-known emission sources

wood based materials

wet lacquer finishes

acid-curing sealants



metal, glass

powder coatings

neutral-curing sealants

Why are showcases still a topic ?

„OLD-TYPE“ SHOWCASE

Σ VOC 2101 $\mu\text{g}/\text{m}^3$

formaldehyde 757 $\mu\text{g}/\text{m}^3$

formic acid 656 $\mu\text{g}/\text{m}^3$

acetic acid 3282 $\mu\text{g}/\text{m}^3$

„NEW-TYPE“ SHOWCASE

Σ VOC $\sim 26 \cdot 10^3 \mu\text{g}/\text{m}^3$

2-propanone-oxime 100 $\mu\text{g}/\text{m}^3$

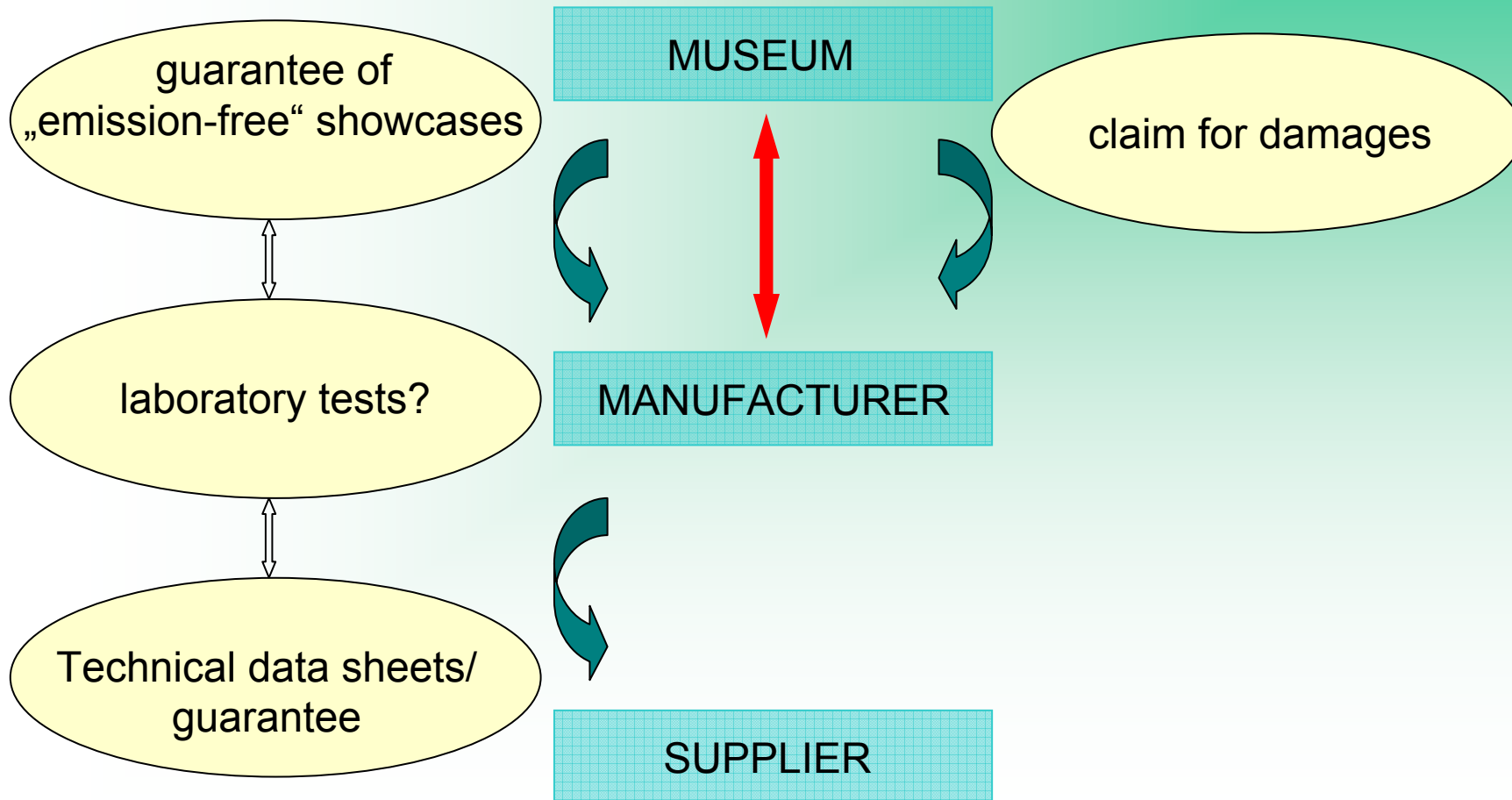
2-butanone-oxime $7 \cdot 10^3 \mu\text{g}/\text{m}^3$

methylisobutylketone-oxime $11 \cdot 10^3 \mu\text{g}/\text{m}^3$

cyclohexanone-oxime 100 $\mu\text{g}/\text{m}^3$

INTRODUCTION

7th Indoor Air Quality Meeting, 15-17 November 2006 Braunschweig/Germany





2006 - 2008

- Screening emission analysis of construction materials
- indoor air quality inside newly constructed showcases:
 - a) after completion
 - b) under museum conditions
- possible synergetic reactions
- evaluation of the results with regard on
 - a) human health
 - b) works of art
- considerations about interpretation models of measuring data
- recommendations for the use of materials

Thermal Extractor TE 2 (Gerstel, Mühlheim/Germany)

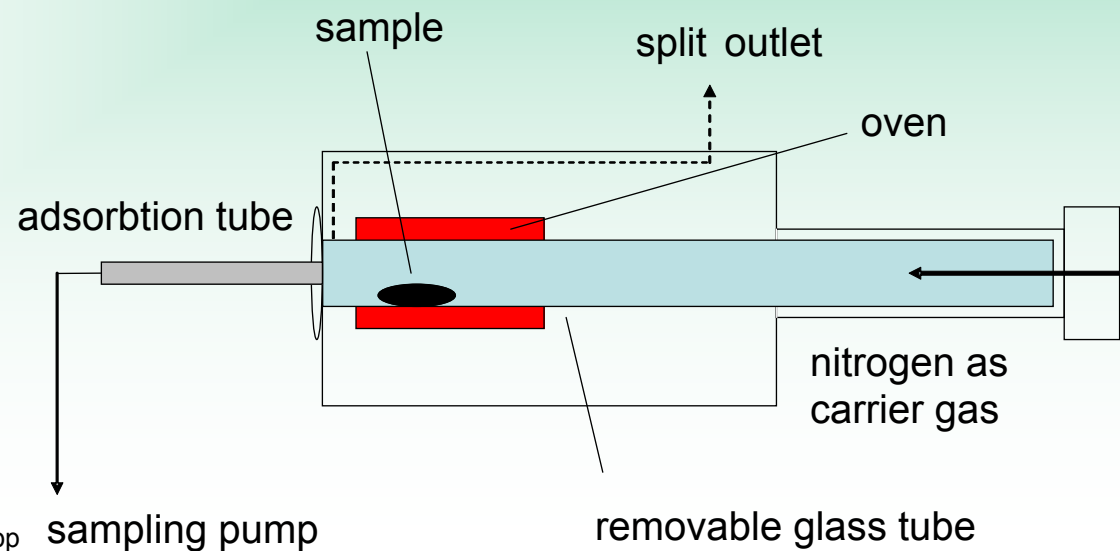
- screening analysis of organic vapour emissions
- quick emission measurements, low cost, time-efficient
- prior to tests in emission test chambers



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Thermal Extractor TE 2 (Gerstel, Mühlheim/Germany)

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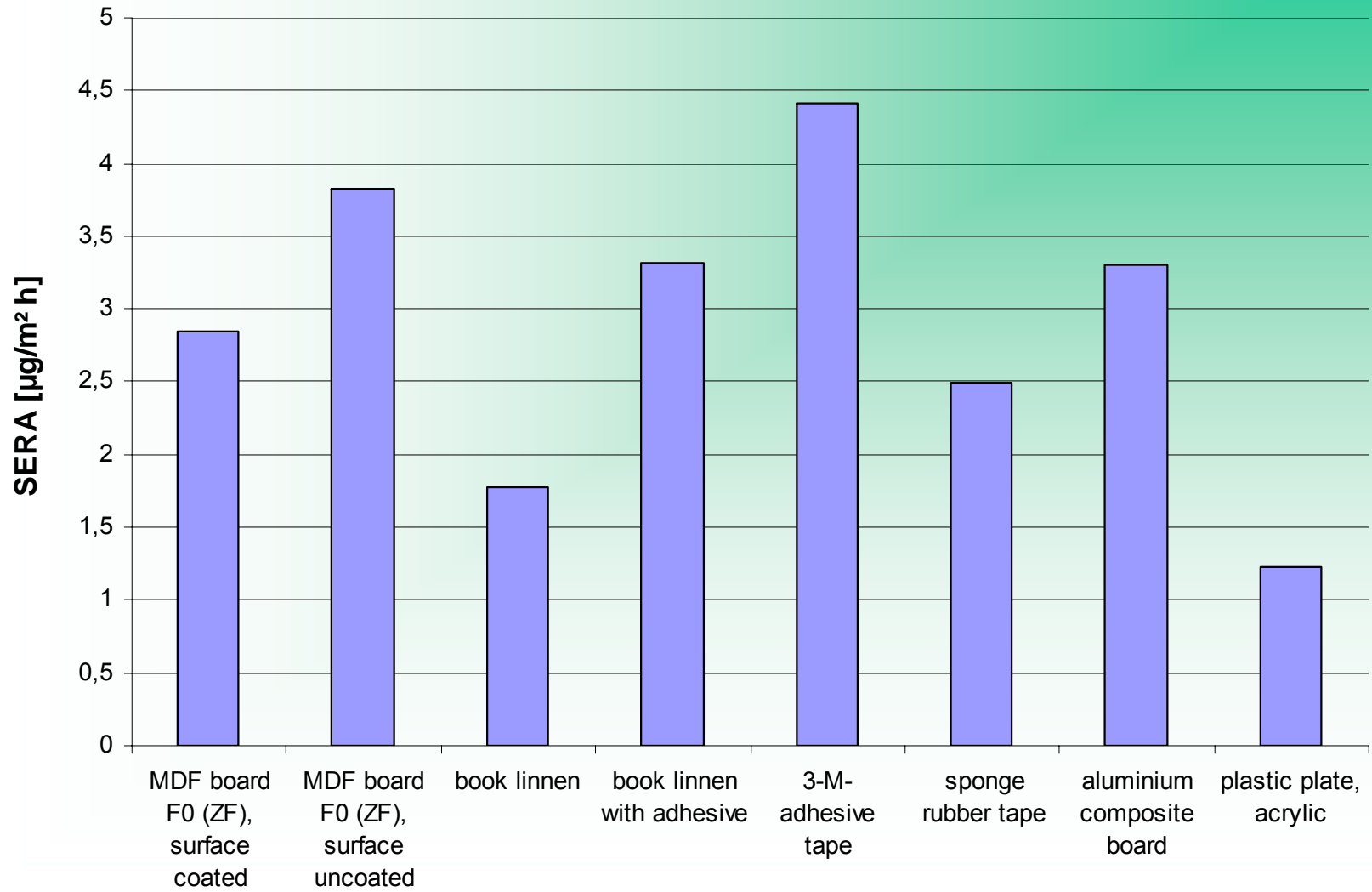


Sampling types and parameters

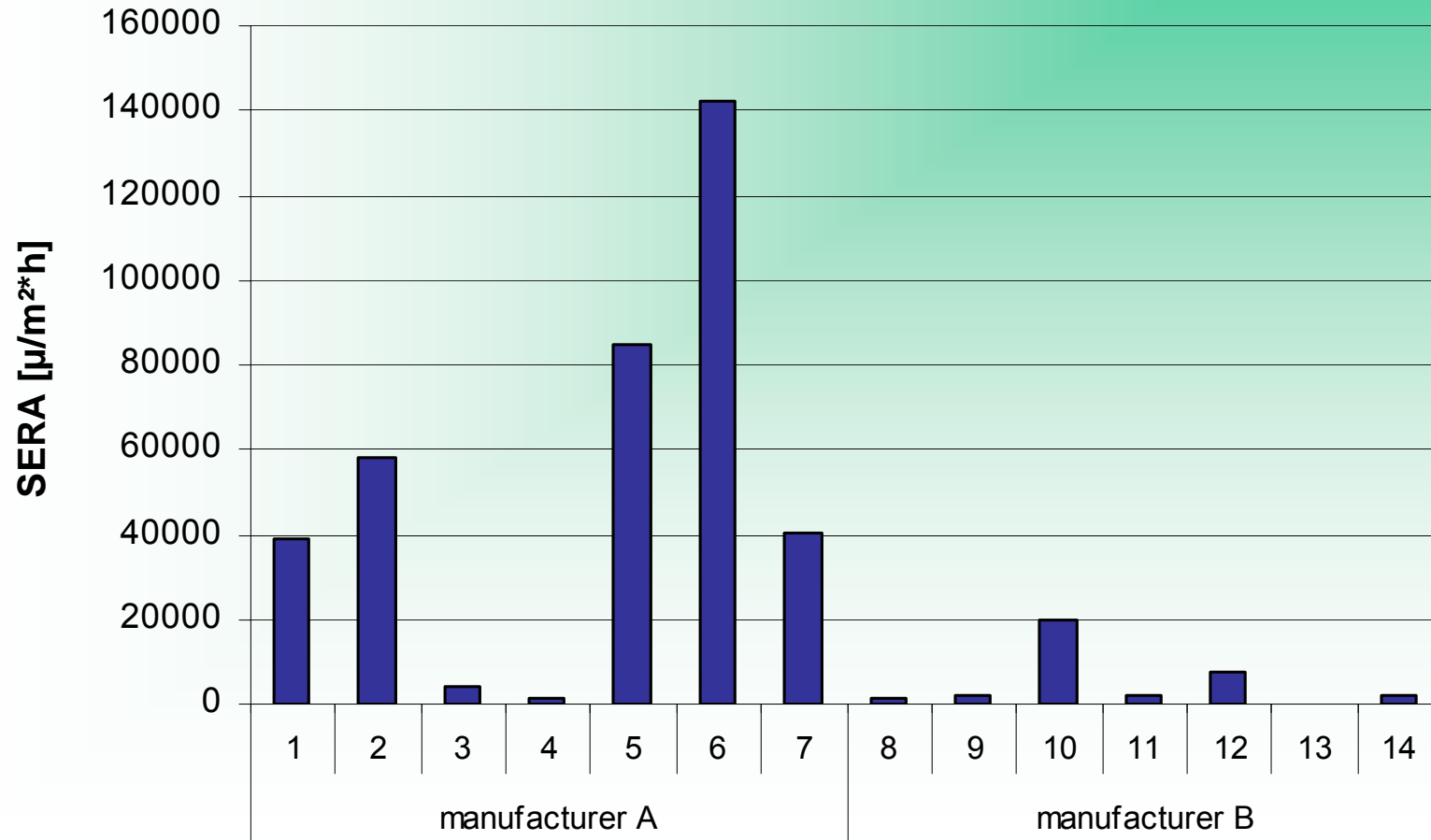
sample type	T [°C]	V [l]	t [min]	n [h ⁻¹]
lacquers, coatings	65	6	40	233
wood-based materials	25	6	40	
textiles	25	6	40	
adhesives, sealants	25	1	10	

RESULTS

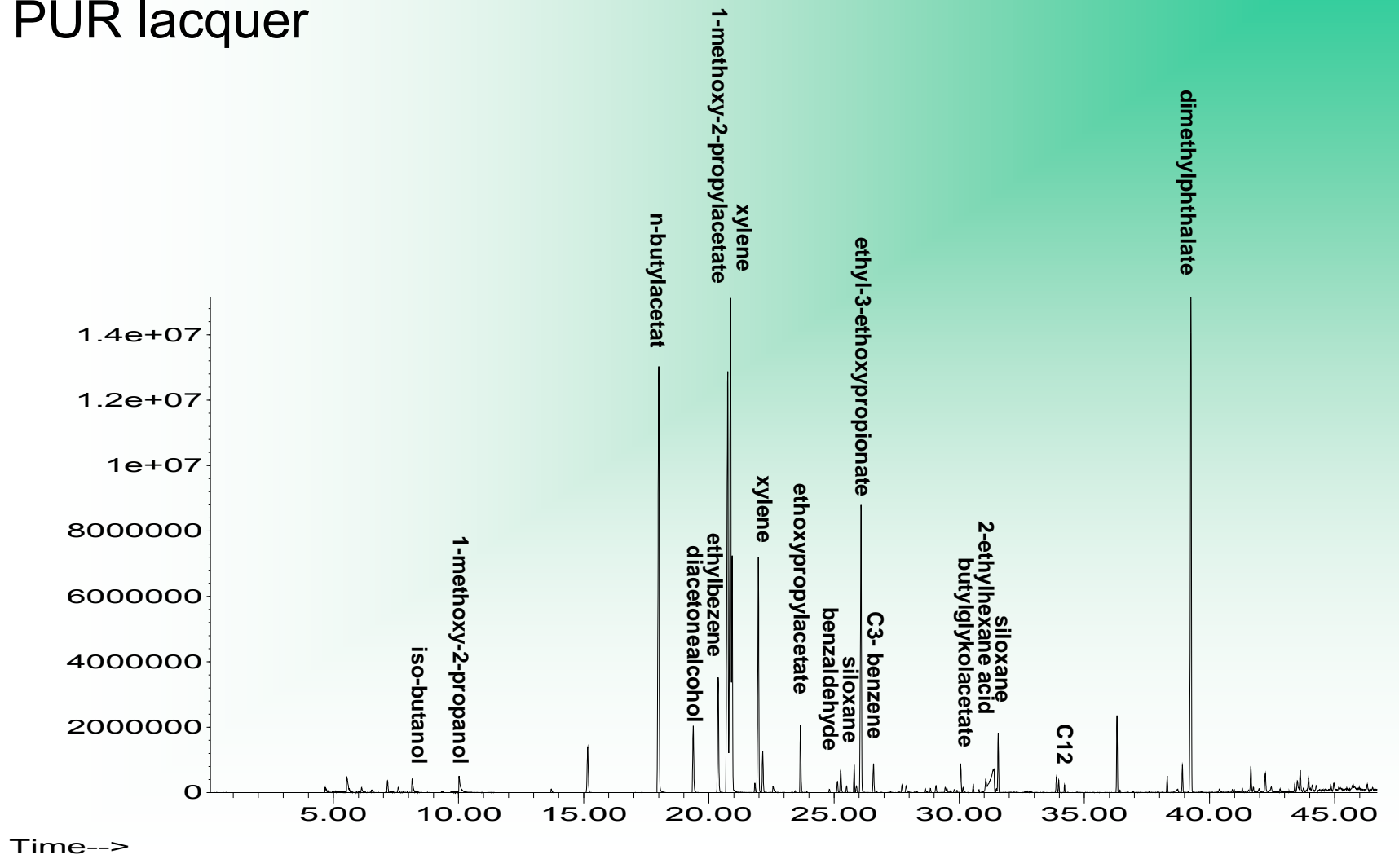
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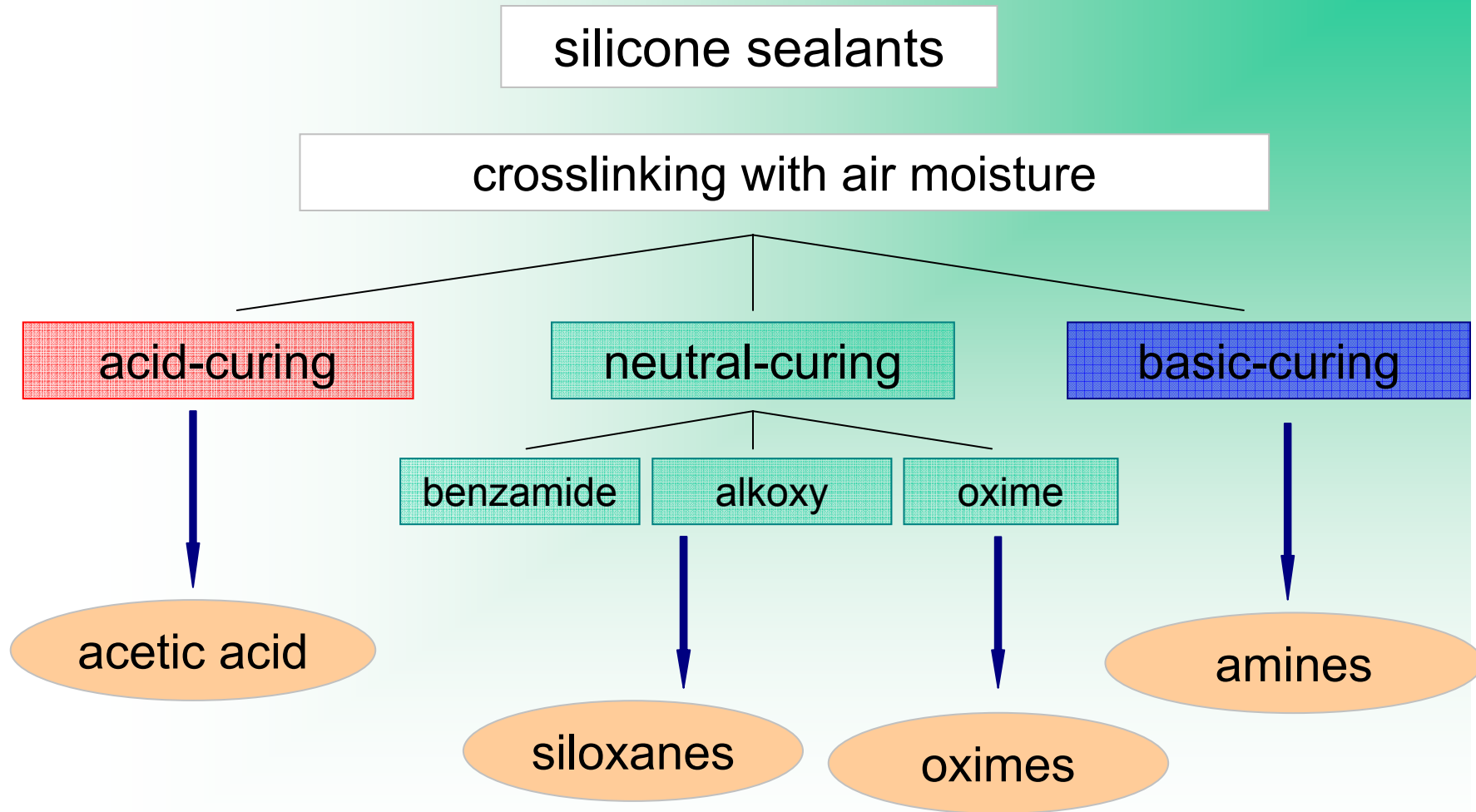


SER_A [$\mu\text{g}/\text{m}^2\cdot\text{h}$] lacquers/coatings

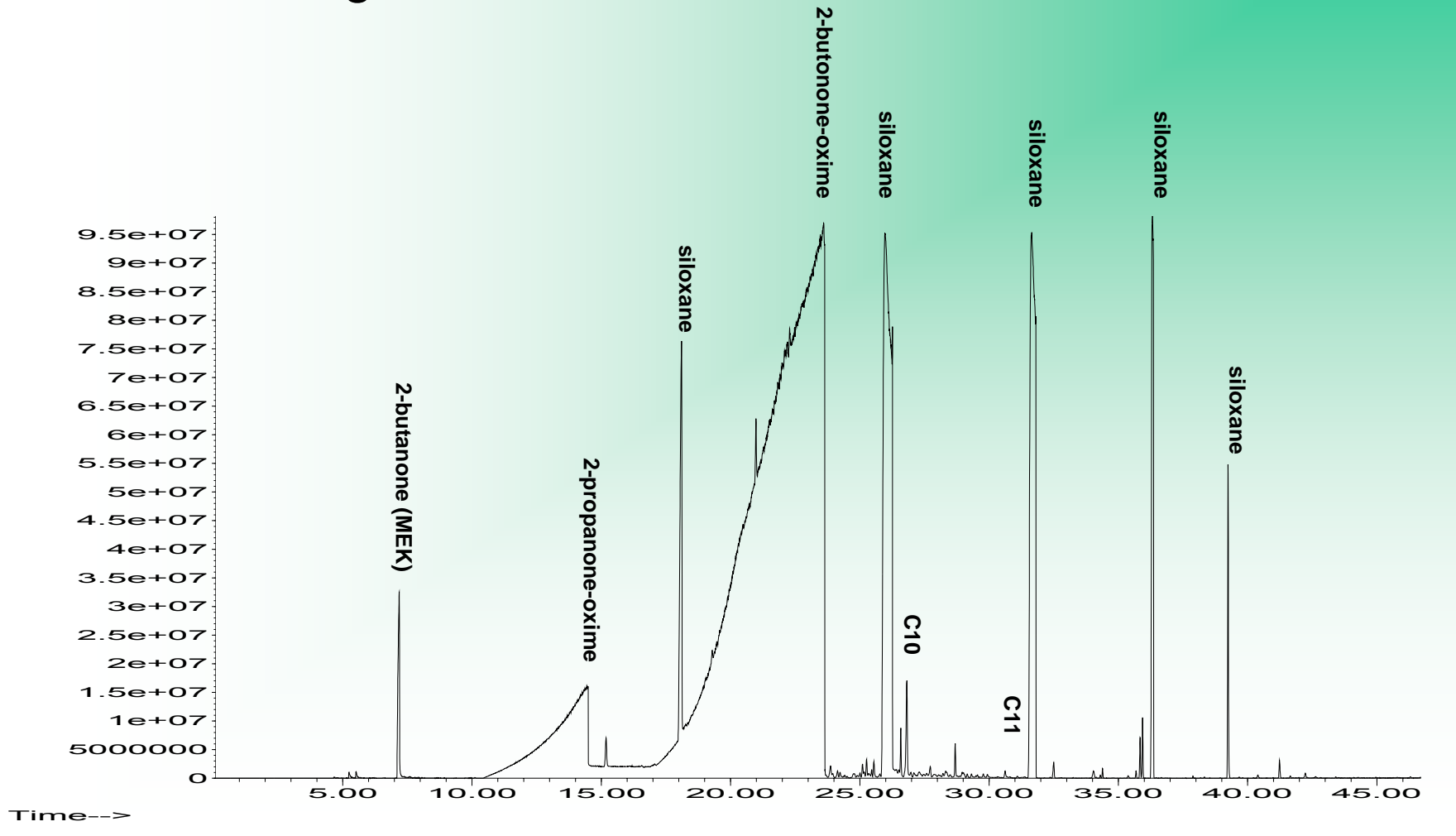


PUR lacquer

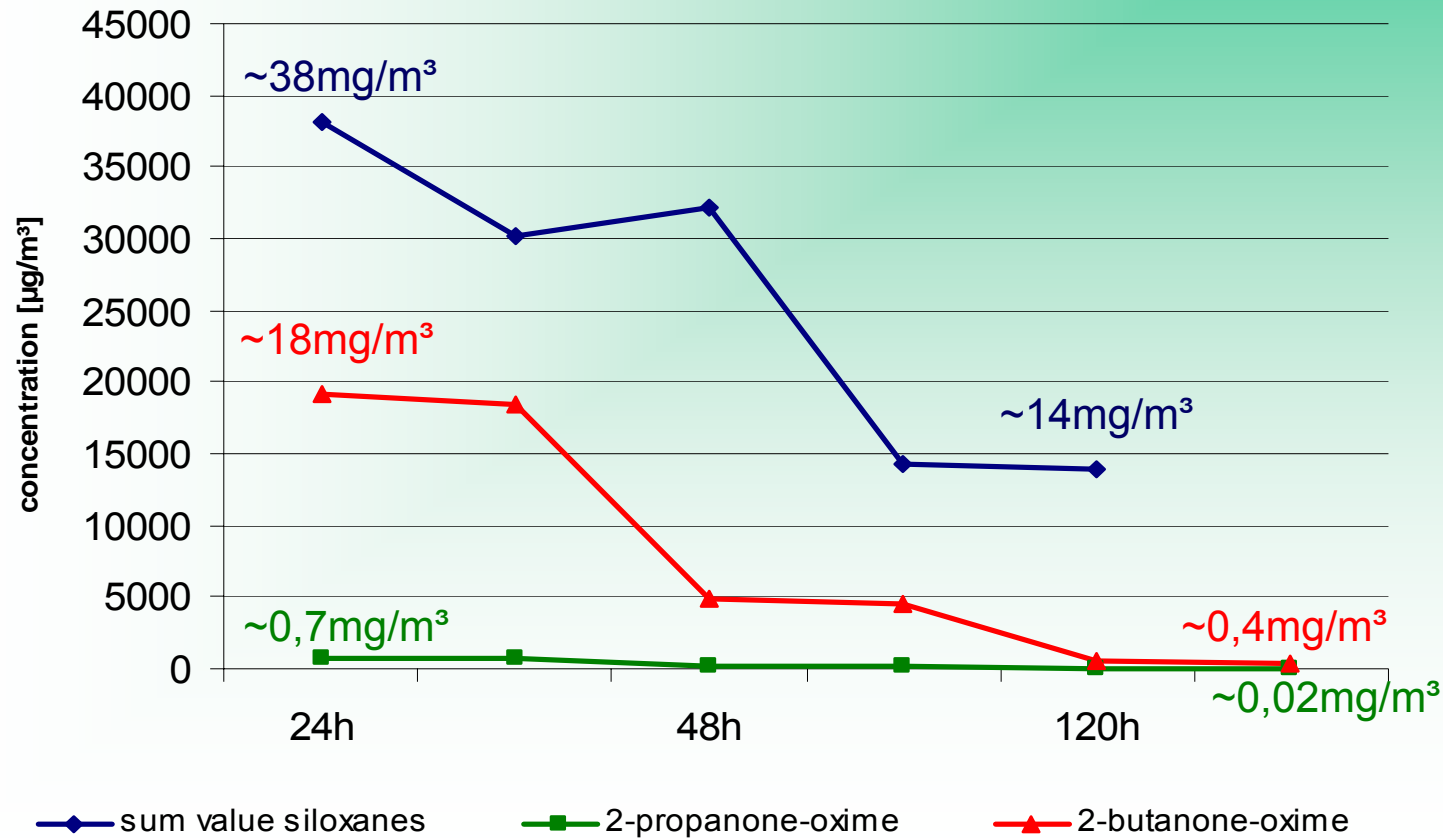




neutral-curing silicone



120h analysis in an emission test chamber



CONCLUSION - LACQUERS I

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carboxylate ester

n-butyl acetate

solvent

dicarboxylate ester

dimethylglutarate

dimethylsuccinate

dimethyladipate

solvent, filming additive

solvent, filming additive

solvent, filming additive,

substitute for labelling required

solvents



glycol ester

ethoxy propyl acetate

1-methoxy-2-propylacetate

ethyl-3-ethoxypropionat

solvent, raw material

solvent, levelling and wetting
agent

solvent

wide range of characteristic
solvents used in the
production of lacquers and
coatings

reaction potential ?

CONCLUSION - SEALANTS

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2-butanone-oxime (MEKO)	allergenic, carcinogenic (cat.III), tumoric, LCI-value of 20 $\mu\text{g}/\text{m}^3$
4-methyl-2-pentanone-oxime	noxious, irritant, allergenic, carcinogenic?
reaction potential reduction to amines	
A aliphatic amines	irritant, strong odour
B aromatic amines	numerous substances are classified as carcinogenic

- comparison
screening emission analysis ↔ emission test chamber
- effects of detected compounds on artefacts
- possible synergetic effects and secondary reactions
 - construction materials
 - cultural artefacts
- considerations about the interpretation of measuring data
- recommendations for the use of materials under museum conditions

