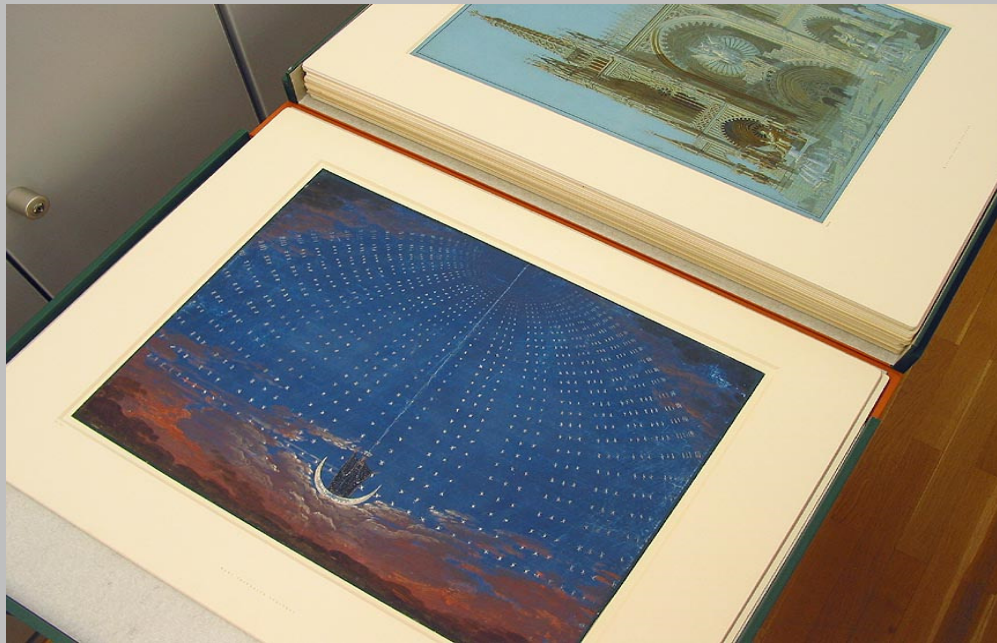


# VOCs in collections of art on paper



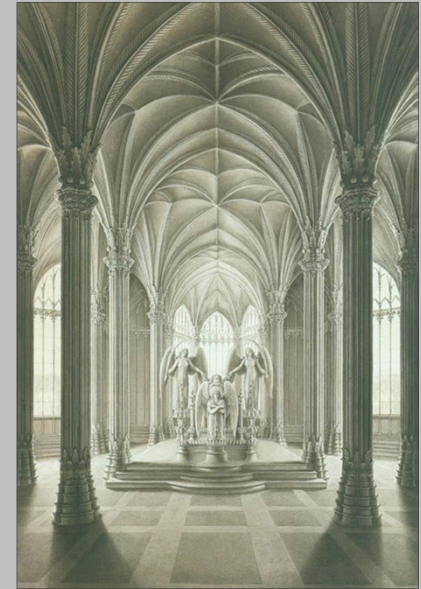
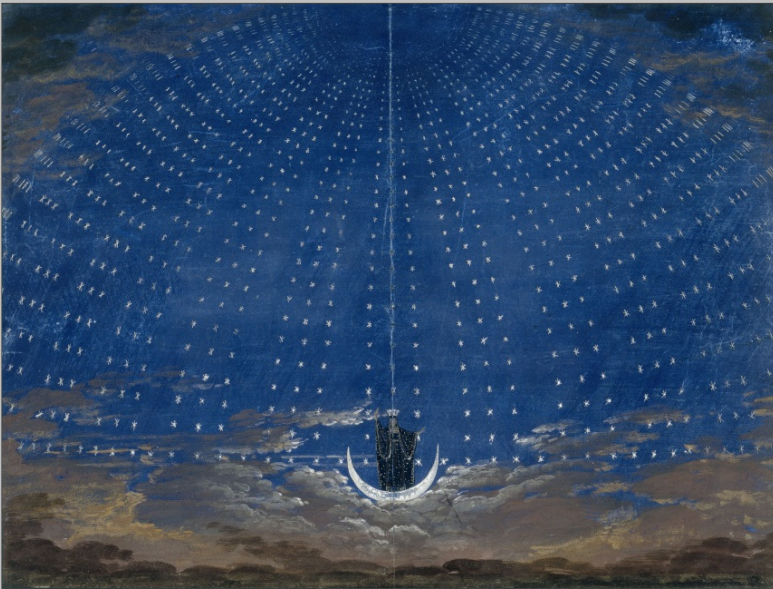
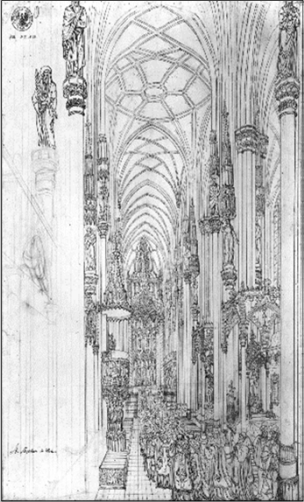
**Fabienne Meyer<sup>1</sup>, Antje Potthast<sup>2</sup>, Gerhard Volland<sup>3</sup>**

<sup>1</sup> Kupferstichkabinett (Museum of drawings and prints), National Museums of Berlin

<sup>2</sup> University of Natural Resources and Life Sciences, Department of Chemistry, Division of Chemistry of Renewables, Biopolymer analytics

<sup>3</sup> Material Testing Institute of the University Stuttgart, Otto-Graf-Institut (MPA/OGI)

# Collection Karl Friedrich Schinkel (1789 - 1841)



# Storage situation

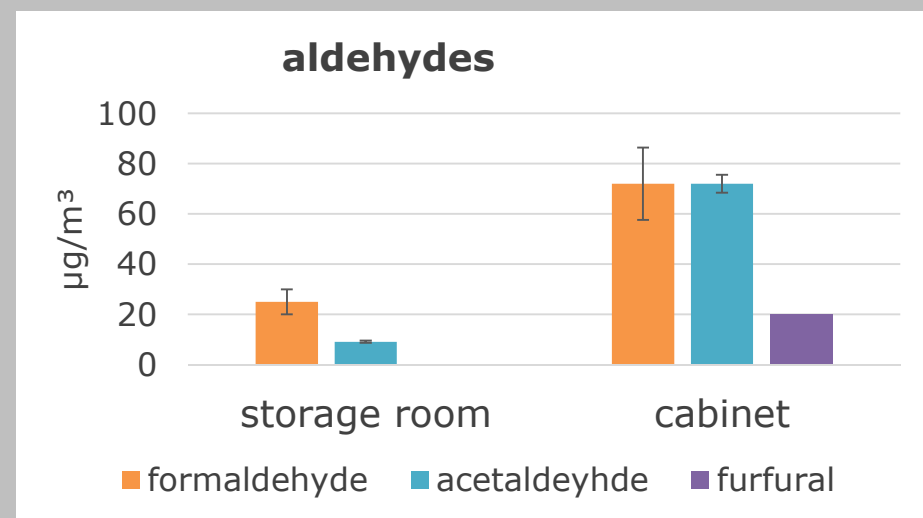
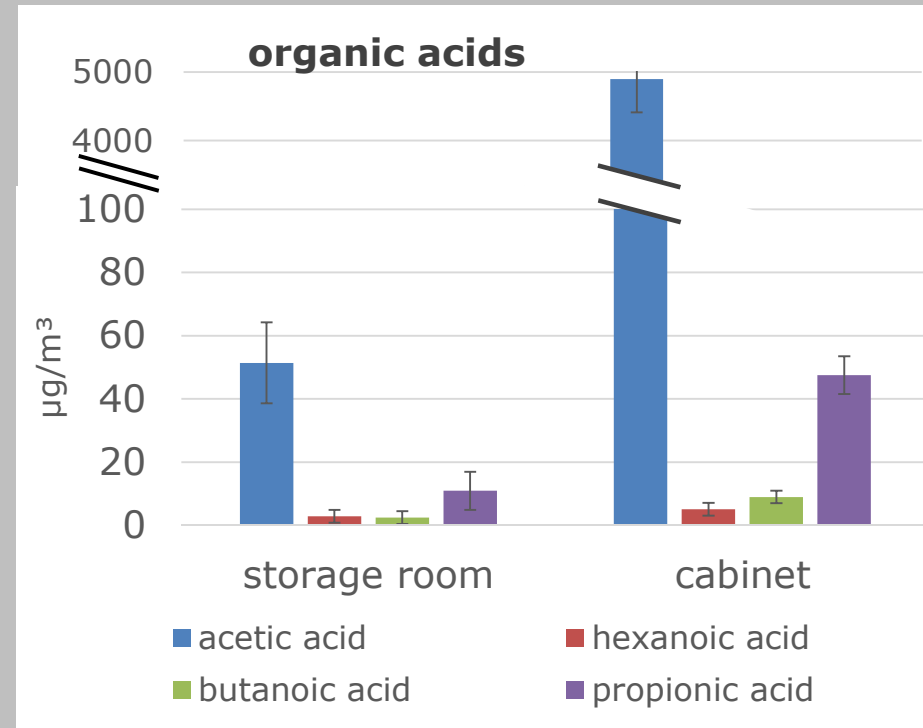


works, mounted on paperboard



portfolios

# 1. Air composition



## 2. Emission sources (Static Headspace – GC/MS)



## 2. Emission sources - acetic acid

### material

### date



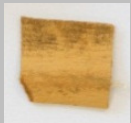
cabinet walls  
(chipboard, melamine)

ca. 1990



shelves (beech wood)

ca. 1990



leather (historic portfolio)

ca. 1845



cardboard (hist. portfolio)

ca. 1845



fabric, dark (hist. portfolio)

ca. 1845



fabric, light (hist. portfolio)

ca. 1845



## 2. Emission sources - acetic acid

### material

### date



cabinet walls  
(chipboard, melamine)

ca. 1990



shelves (beech wood)

ca. 1990



leather (historic portfolio)

ca. 1845



cardboard (hist. portfolio)

ca. 1845



fabric, dark (hist. portfolio)

ca. 1845



fabric, light (hist. portfolio)

ca. 1845



historic paperboard mount

ca. 1845



## 2. Emission sources - acetic acid

### material

### date



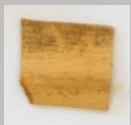
cabinet walls  
(chipboard, melamine)

ca. 1990



shelves (beech wood)

ca. 1990



leather (historic portfolio)

ca. 1845



cardboard (hist. portfolio)

ca. 1845



fabric, dark (hist. portfolio)

ca. 1845



fabric, light (hist. portfolio)

ca. 1845



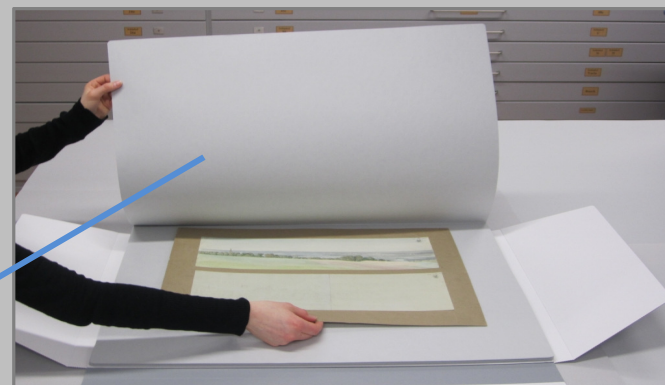
historic paperboard mount

ca. 1845



archival cardboard  
(3% CaCO<sub>3</sub>)

ca. 2010





## 2. Emission sources - acetic acid

material

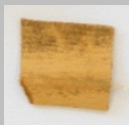
0 50 100 150 200



cabinet walls  
(chipboard, melamine)



shelves (beech wood)



leather (historic portfolio)



cardboard (hist. portfolio)



fabric, dark (hist. portfolio)



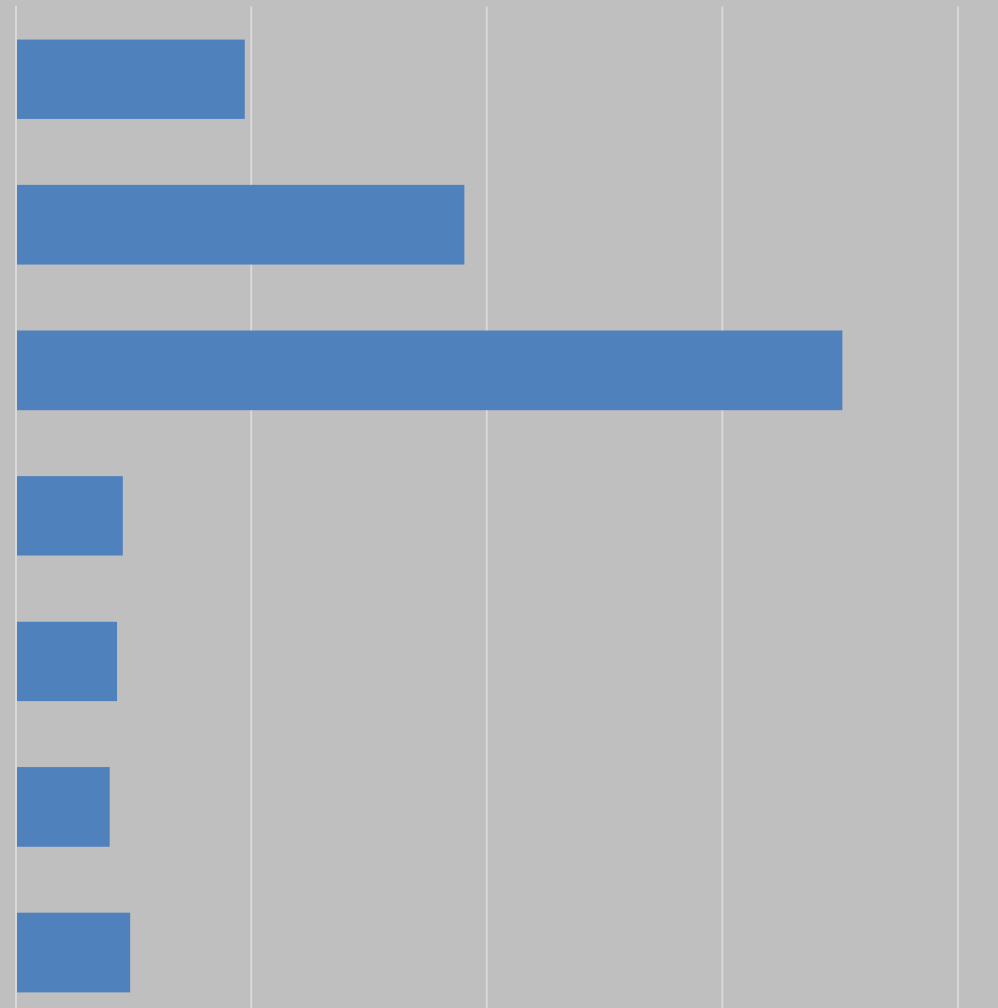
fabric, light (hist. portfolio)



historic paperboard mount

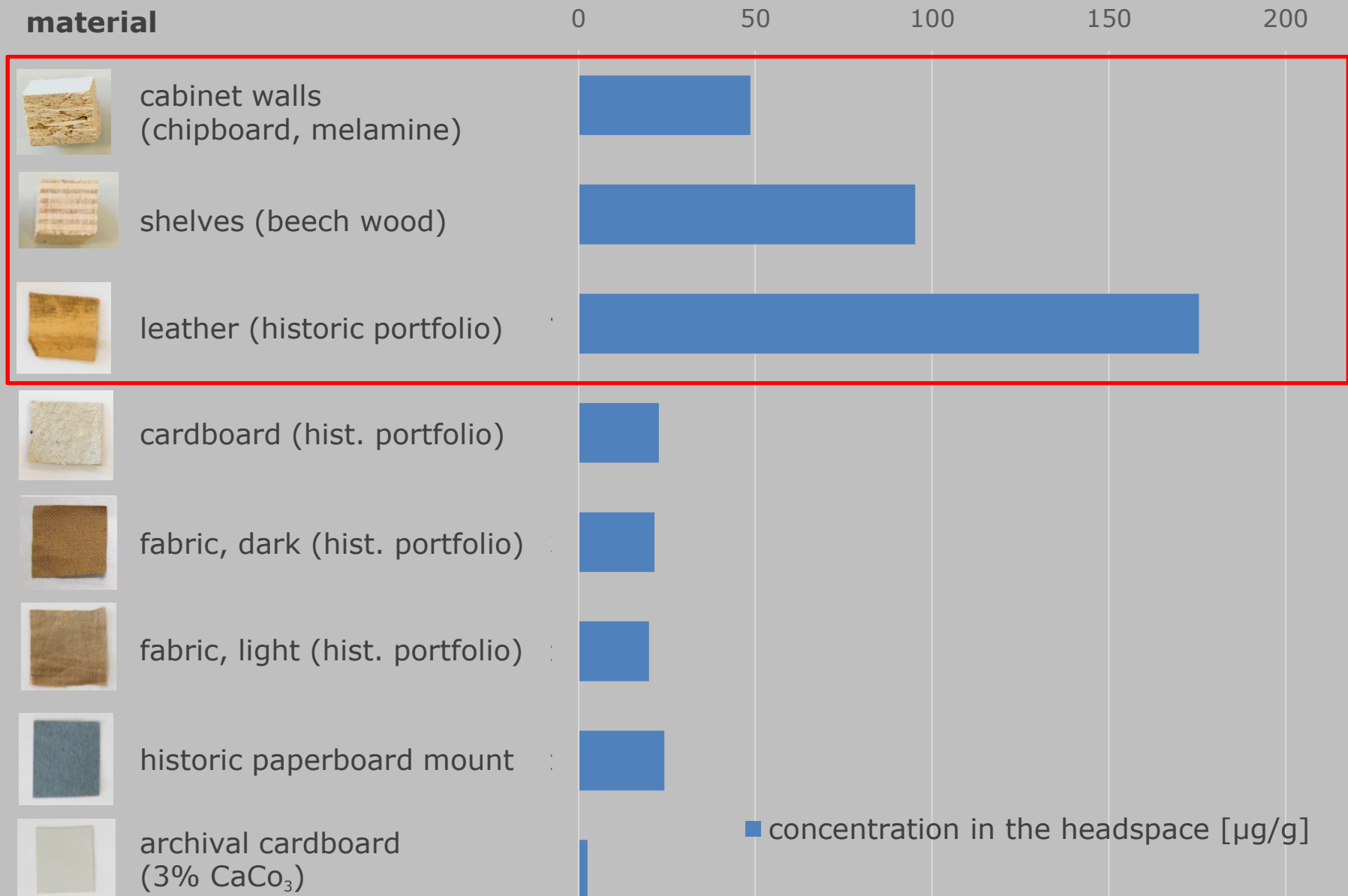


archival cardboard  
(3% CaCO<sub>3</sub>)

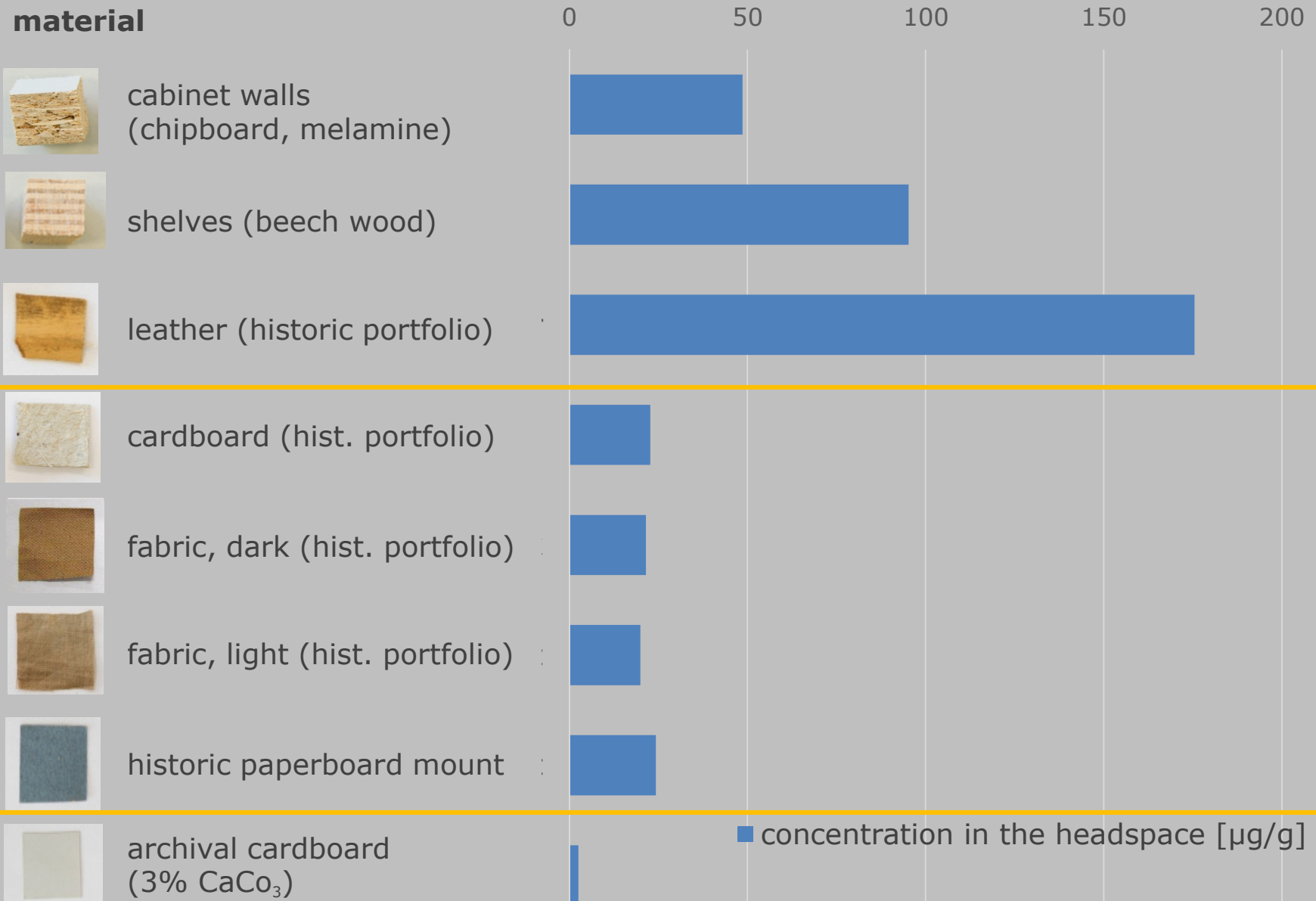


■ concentration in the headspace [ $\mu\text{g/g}$ ]

## 2. Emission sources - acetic acid



## 2. Emission sources - acetic acid



## 2. Emission sources - acetic acid

material

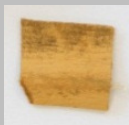
0 50 100 150 200



cabinet walls  
(chipboard, melamine)



shelves (beech wood)



leather (historic portfolio)



cardboard (hist. portfolio)



fabric, dark (hist. portfolio)



fabric, light (hist. portfolio)

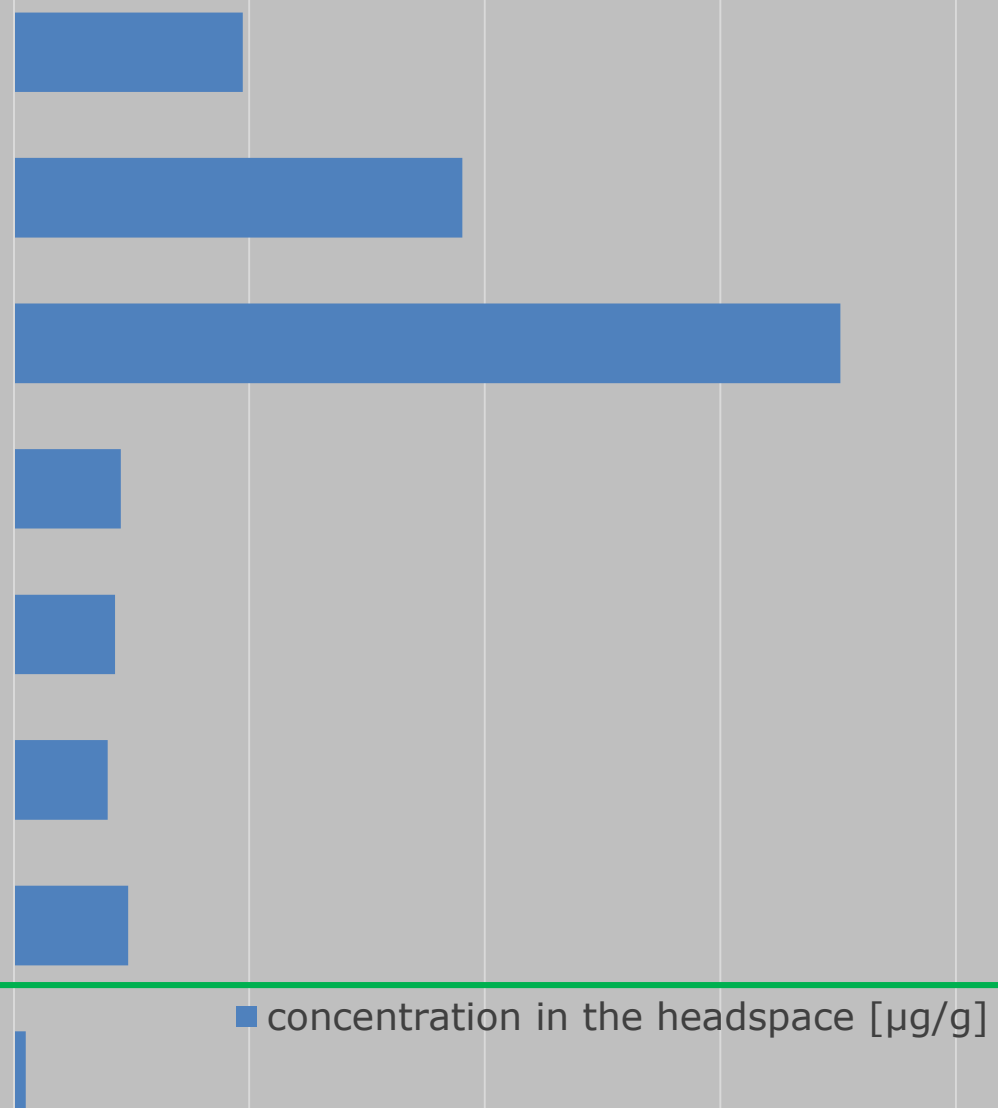


historic paperboard mount

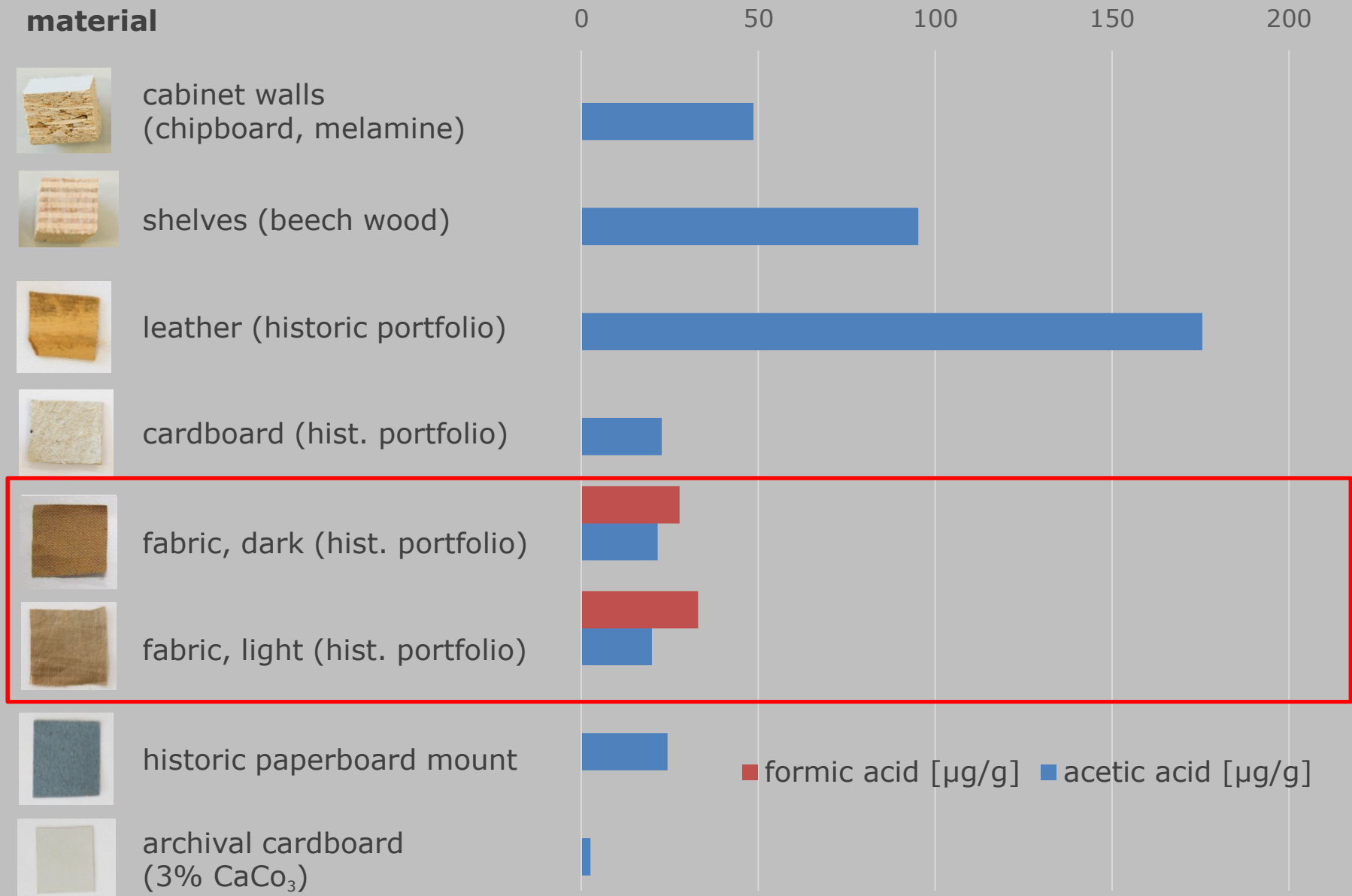


archival cardboard  
(3% CaCO<sub>3</sub>)

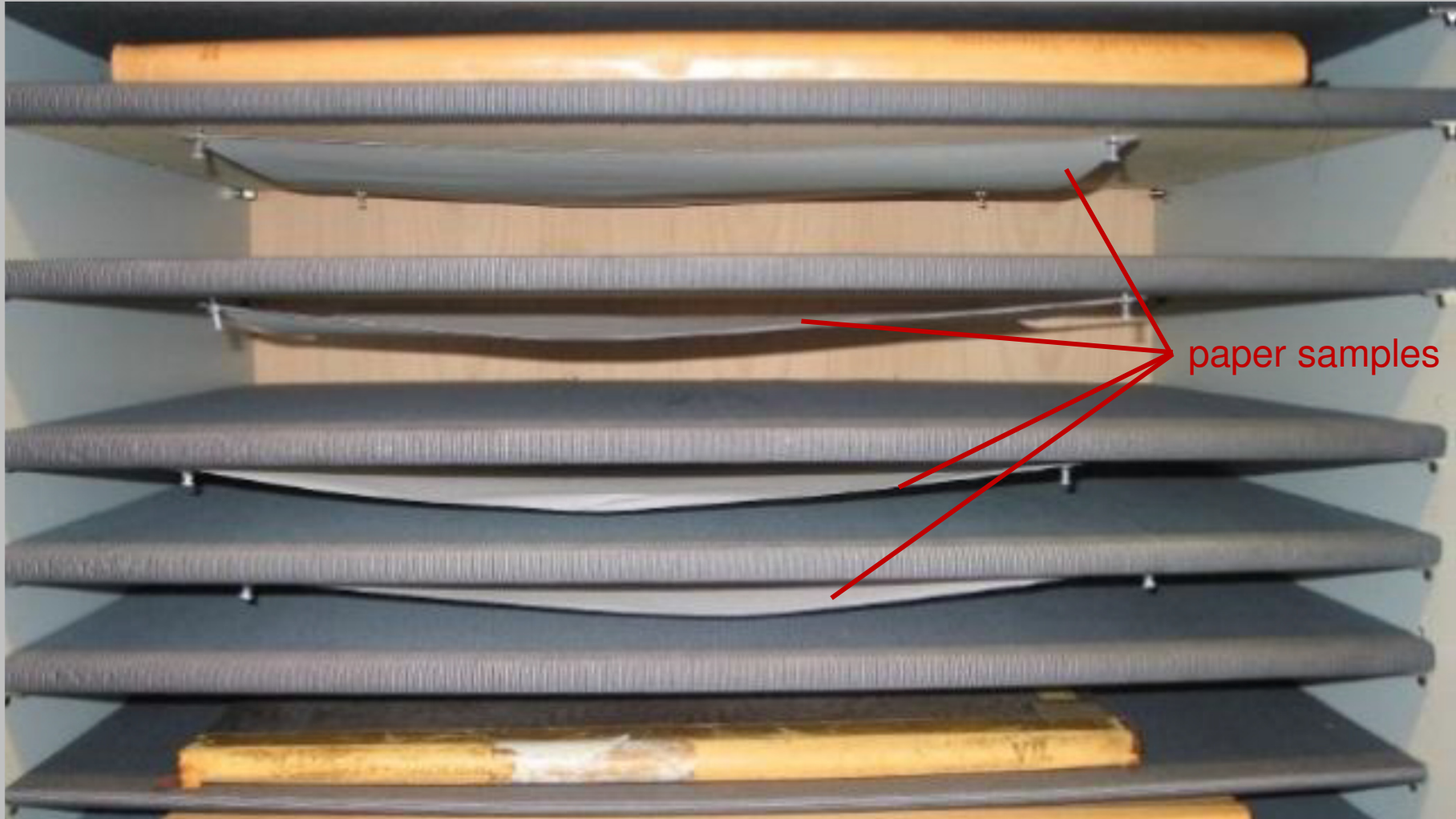
■ concentration in the headspace [μg/g]



## 2. Emission sources - formic acid



### 3. Interaction Paper - VOCs

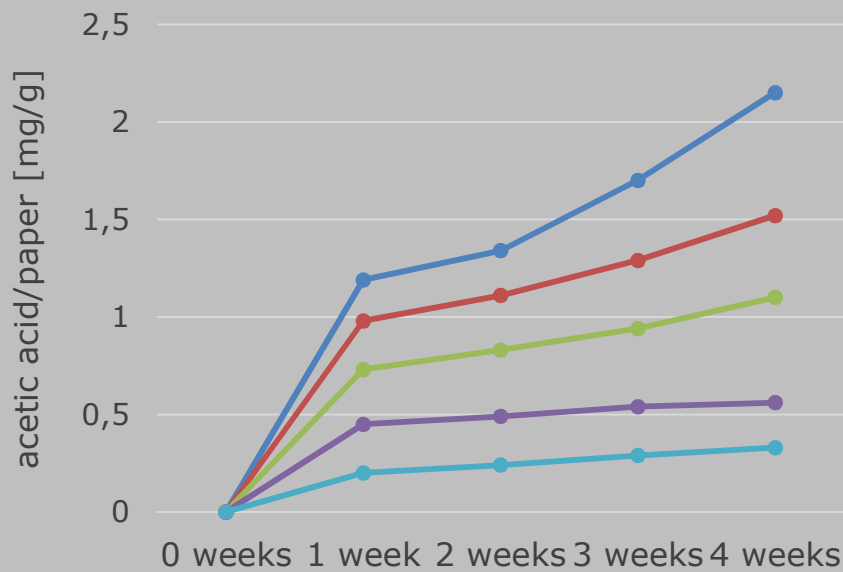


### 3. Interaction Paper - VOCs

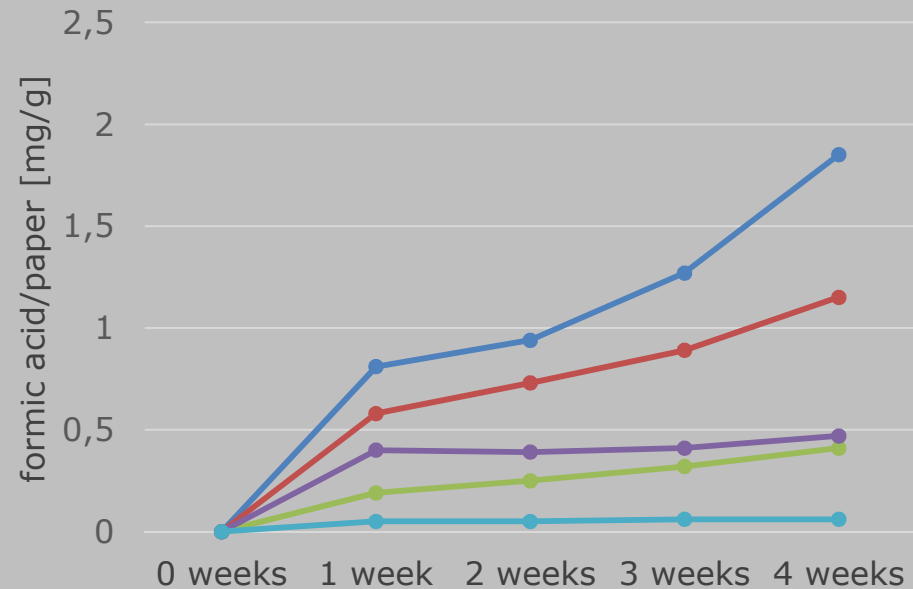
<b>paper</b>	<b>alkaline reserve</b>
Whatman no.1 filter paper	none
historic rag paper (gelatin sizing)	unknown
archival cardboard	ca. 3%
copying paper (lignin free)	ca. 20%
coated paper (lignin free)	alkaline surface coating

### 3. Interaction Paper - VOCs

adsorption of acetic acid [mg/g]



adsorption formic acid [mg/g]



- paper with alkaline surface coating
- copying paper (20% CaCO<sub>3</sub>)
- archival cardboard (3% CaCO<sub>3</sub>)
- hist. rag paper
- Whatman



### 3. Interaction Paper - VOCs

	proportion acetic acid: formic acid*
Whatman No 1 Filter Paper	1,0 : 0,2
historic rag paper	1,0 : 0,8
copying paper (20% CaCo <sub>3</sub> )	1,0 : 0,8
paper with alkaline coating	1,0 : 0,9
archival cardboard (3% CaCo <sub>3</sub> )	1,0 : 0,4

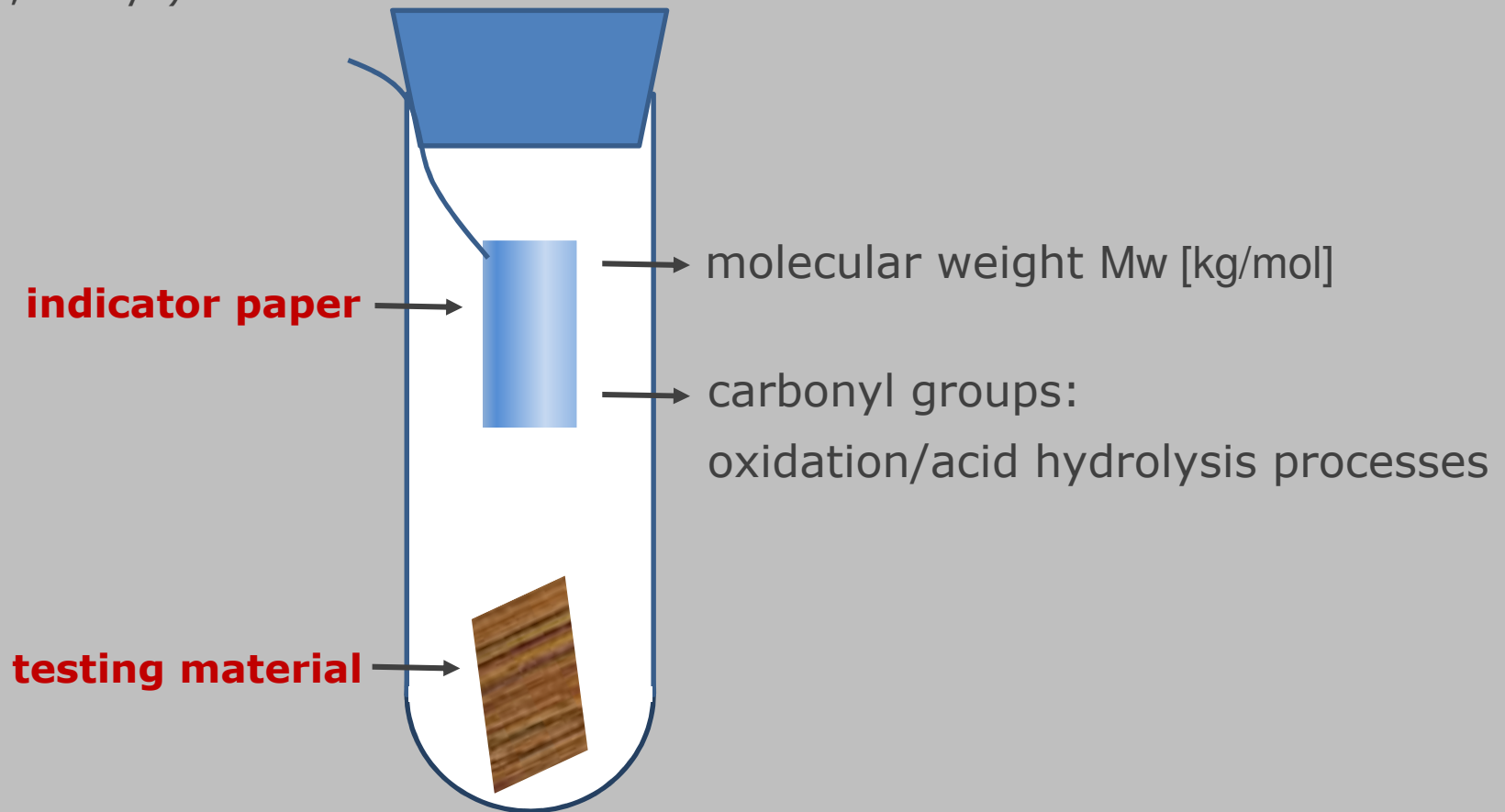
\*adsorption after 4 weeks exposure

**Adsorption**  
**=**  
**Degradation**  
**?**

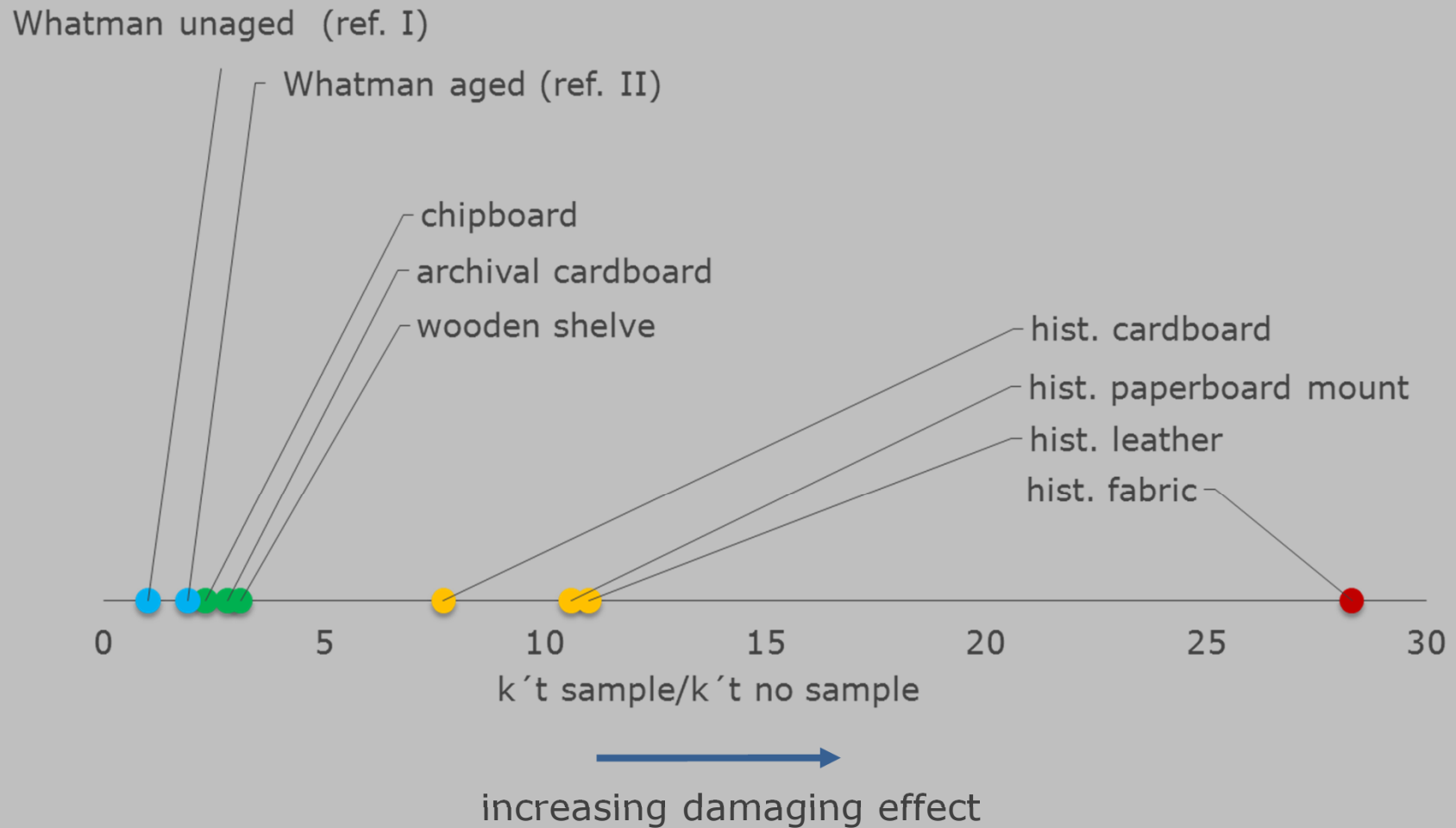
## 4. Effect of VOCs on paper

### Strlič et al. test\*:

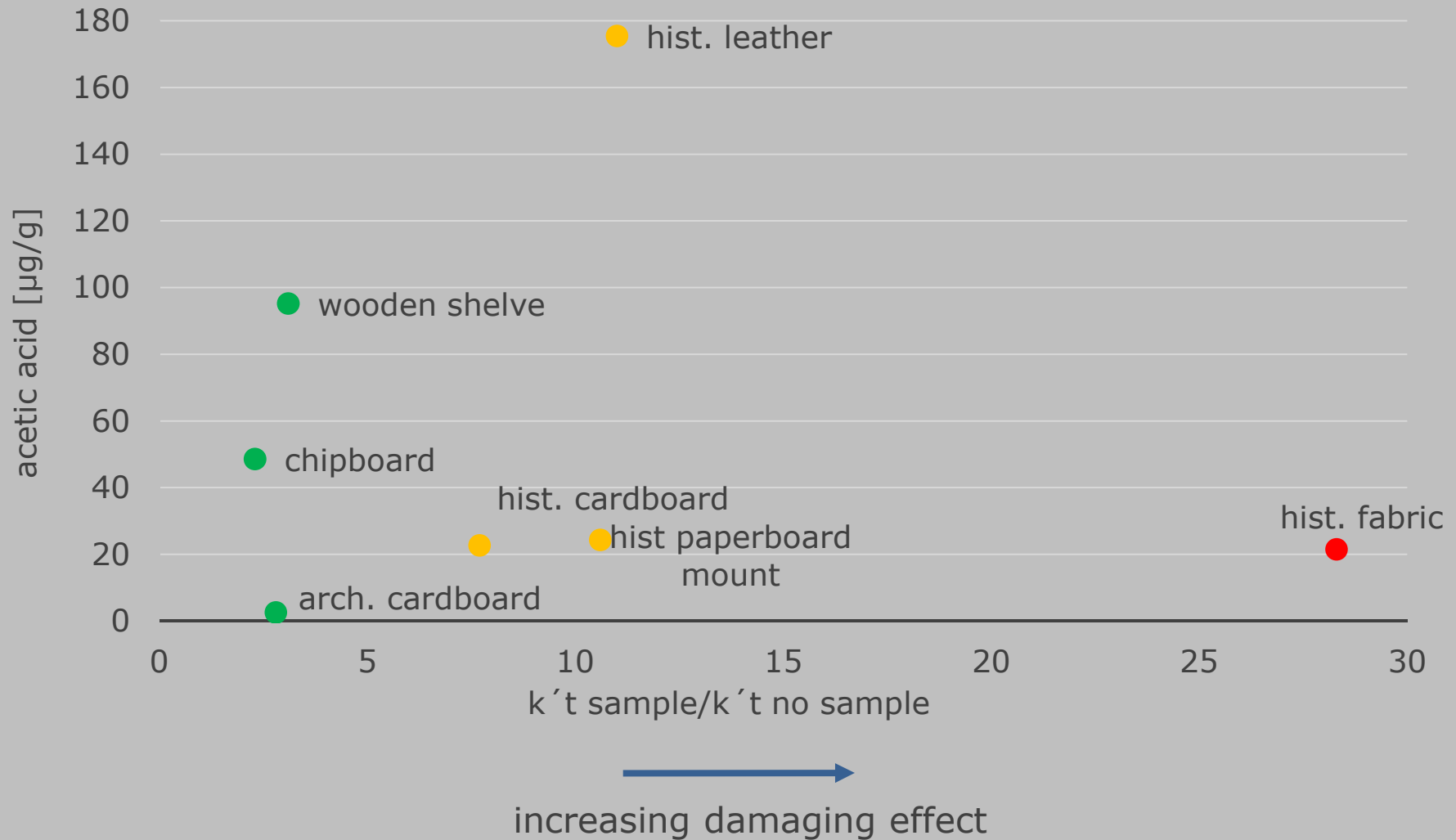
(100°C, 6 days)



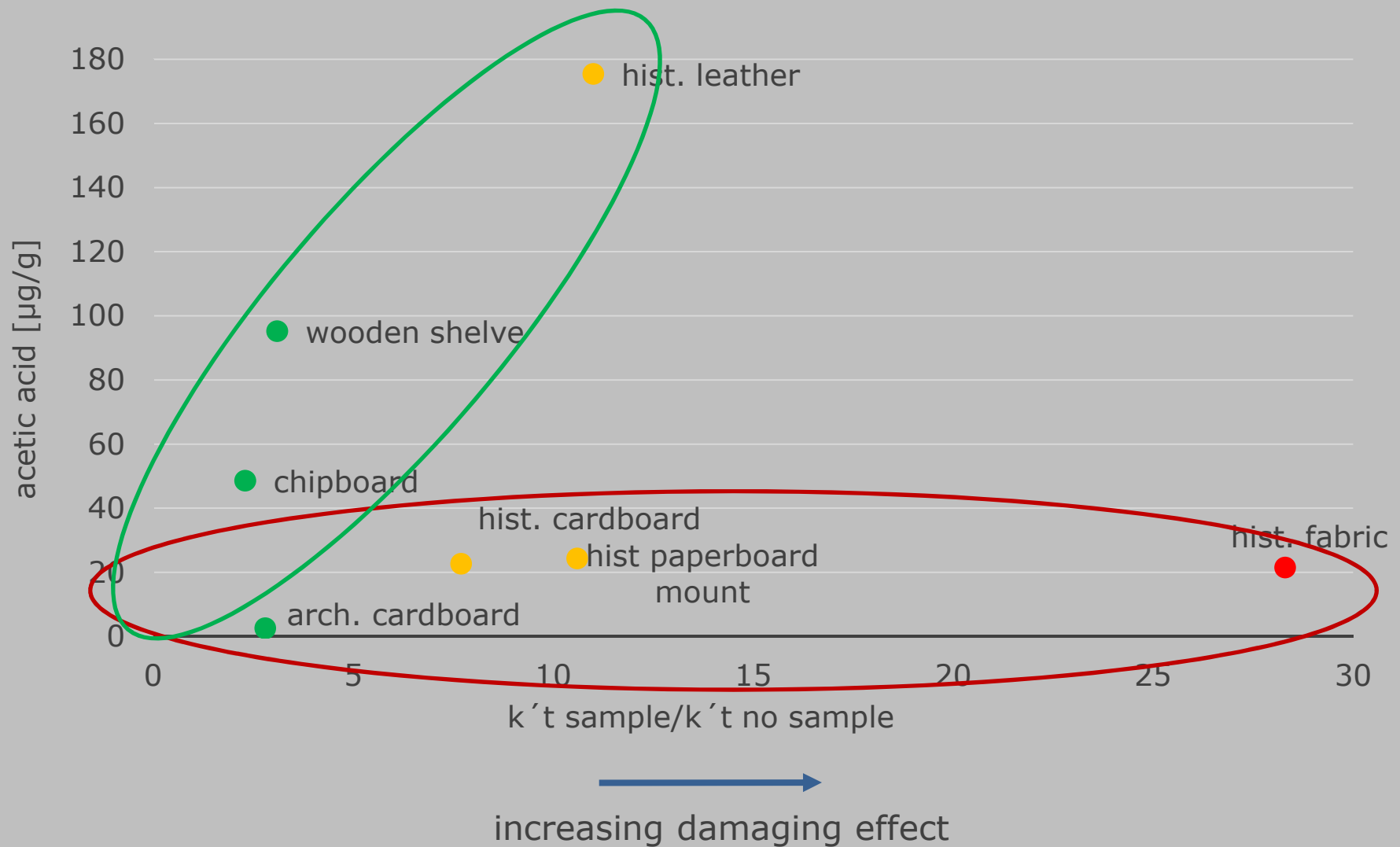
# 4. Effect of VOCs on paper (Whatman no.1)



## 4. Effect of VOCs on paper (Whatman no.1)



## 4. Effect of VOCs on paper (Whatman no.1)



## 5. Measures: exchange of portfolios



## 5. Measures: exchange of wooden shelves



wooden shelves



powder coated metal shelves



## 5. Measures: increasing the AER



ventilation slots

## 5. Measures: sealing the wooden back wall



sealing of the back side

Thank you!

<http://archiv.ub.uni-heidelberg.de/artdok/3591/>