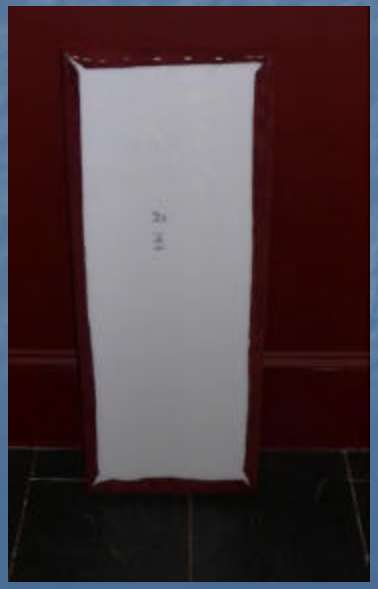
Microclimate Packages for Polychrome Wood

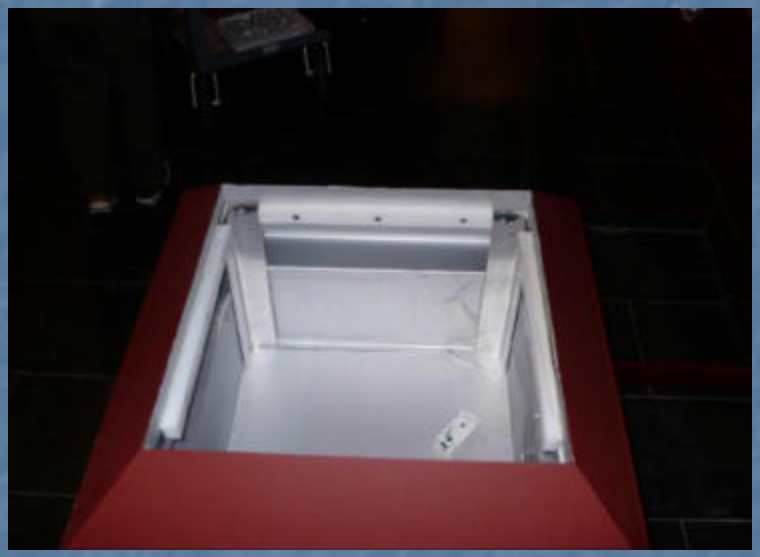
Mervin Richard
National Gallery of Art

Display Cases for Polychrome Wood

Display Cases for Polychrome Wood

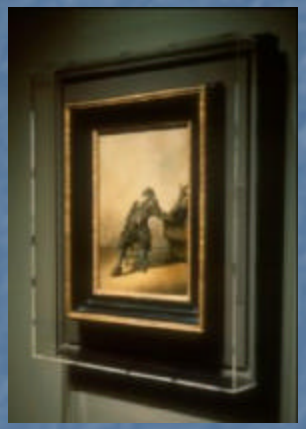
Display Cases for Polychrome Wood



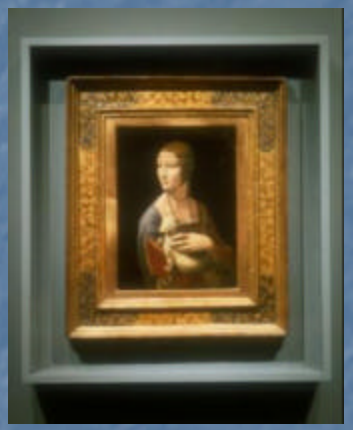


Microclimate Packages for Polychrome Wood

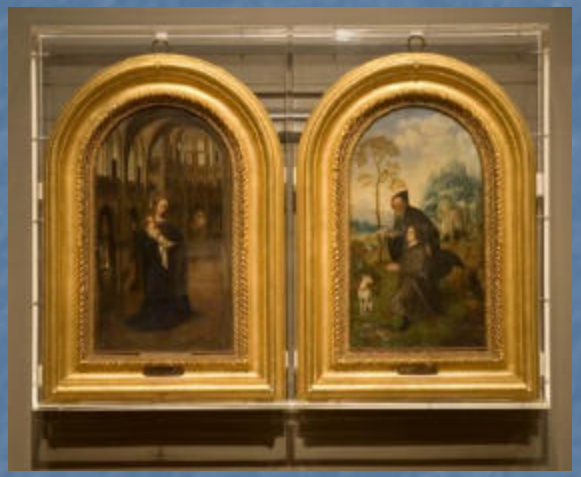
Microclimate Vitrine



Microclimate Box

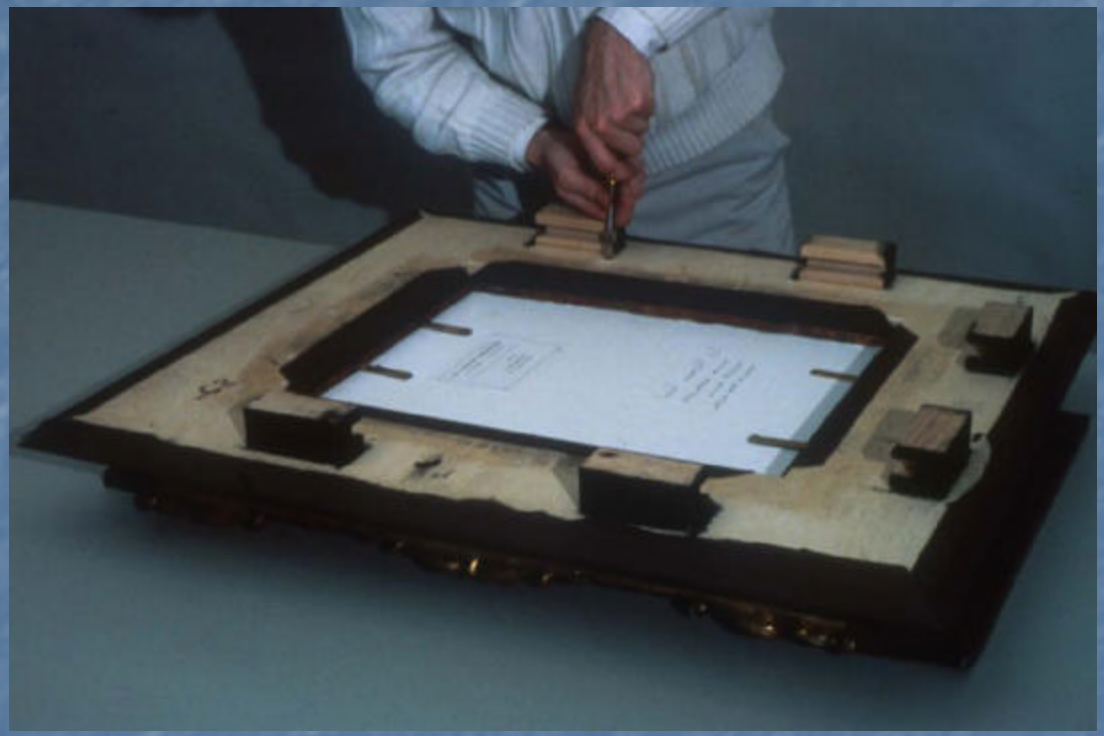


Climabox

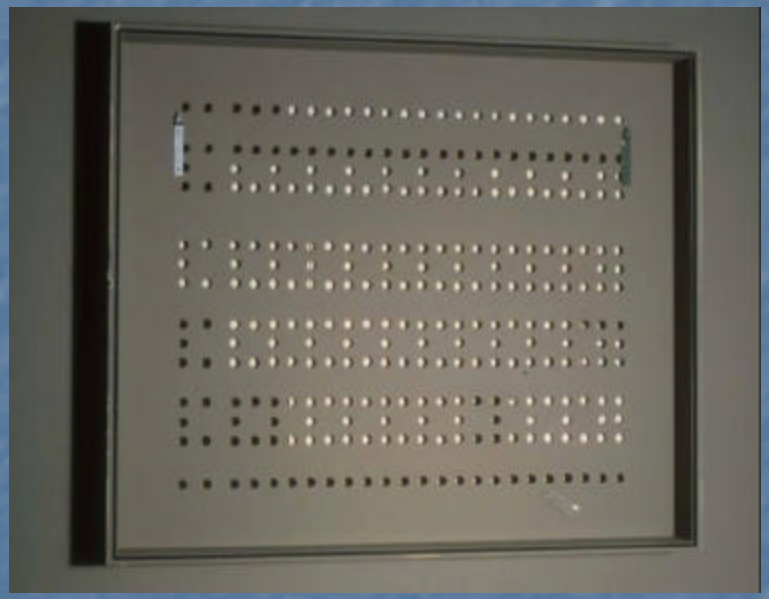


Microclimate Package

Microclimate Packages for Polychrome Wood



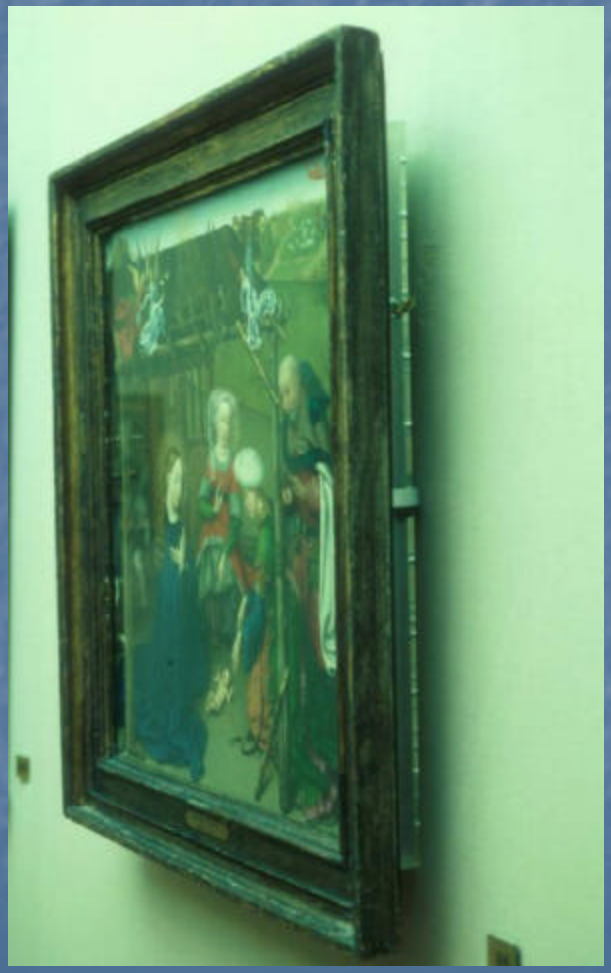
Microclimate Packages for Polychrome Wood



Microclimate Packages for Polychrome Wood

Jacques Daret
*Nativity, c. 1*440
Oil on panel
Berlin, Staatliche Museen, Gemaldegalerie

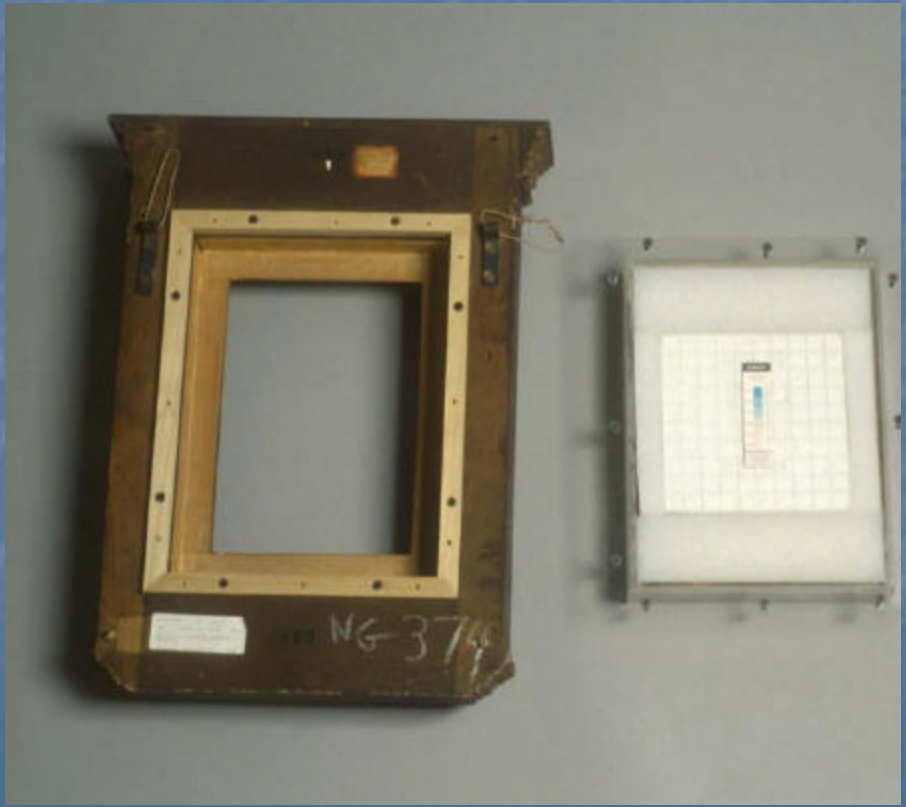
Microclimate Packages for Polychrome Wood



Microclimate Packages for Polychrome Wood

North Italian 15th Century
Profile Portrait of a Boy, c. 1460/1470
tempera and oil on panel
National Gallery of Art

Microclimate Packages for Polychrome Wood



Microclimate Packages
Metal laminate Foil

Marvelseal 360

Mitsubishi PE/AL/PE/PET
Sealing Foil

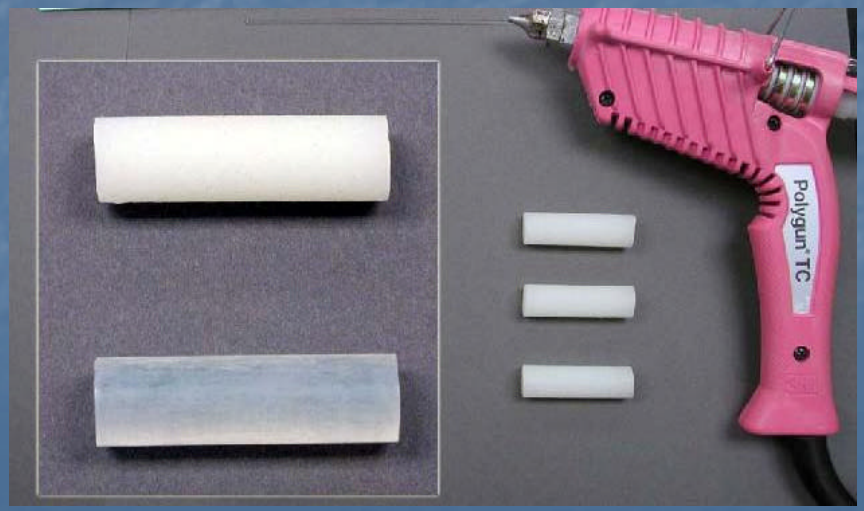
Microclimate Packages
Glazing Materials

- Acrylic glazing
  - Anti-reflective
  - Static-dispersive
  - UV filtering
- Laminated Glass
  - Anti-Reflective
  - UV filtering

Microclimate Packages
Heat Sealing

Microclimate Packages Adhesives

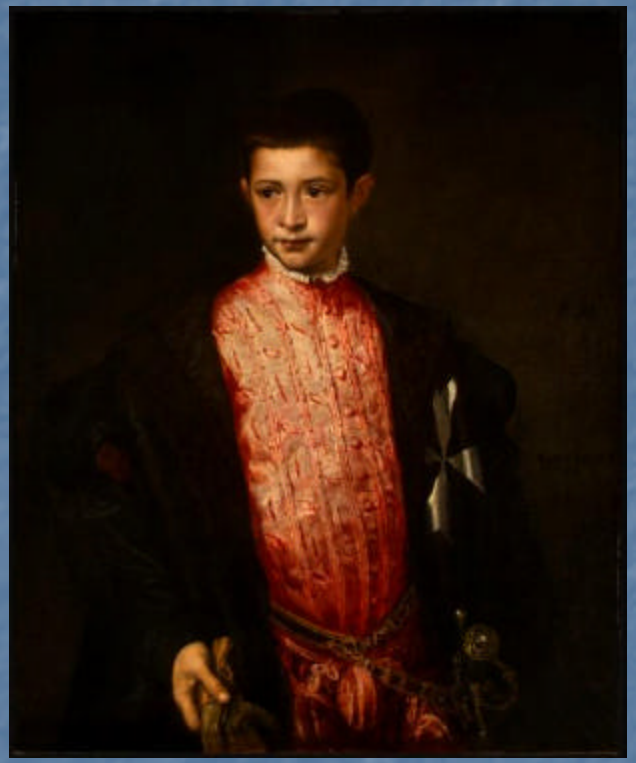
- **3M™ Scotch-Weld™ Hot Melt Adhesive**
  - # 3748
    - particularly good on glass and acrylic
  - # 3797
  - Off-White
  - Non-corrosive
  - Used for electrical components



Microclimate Packages Adhesives

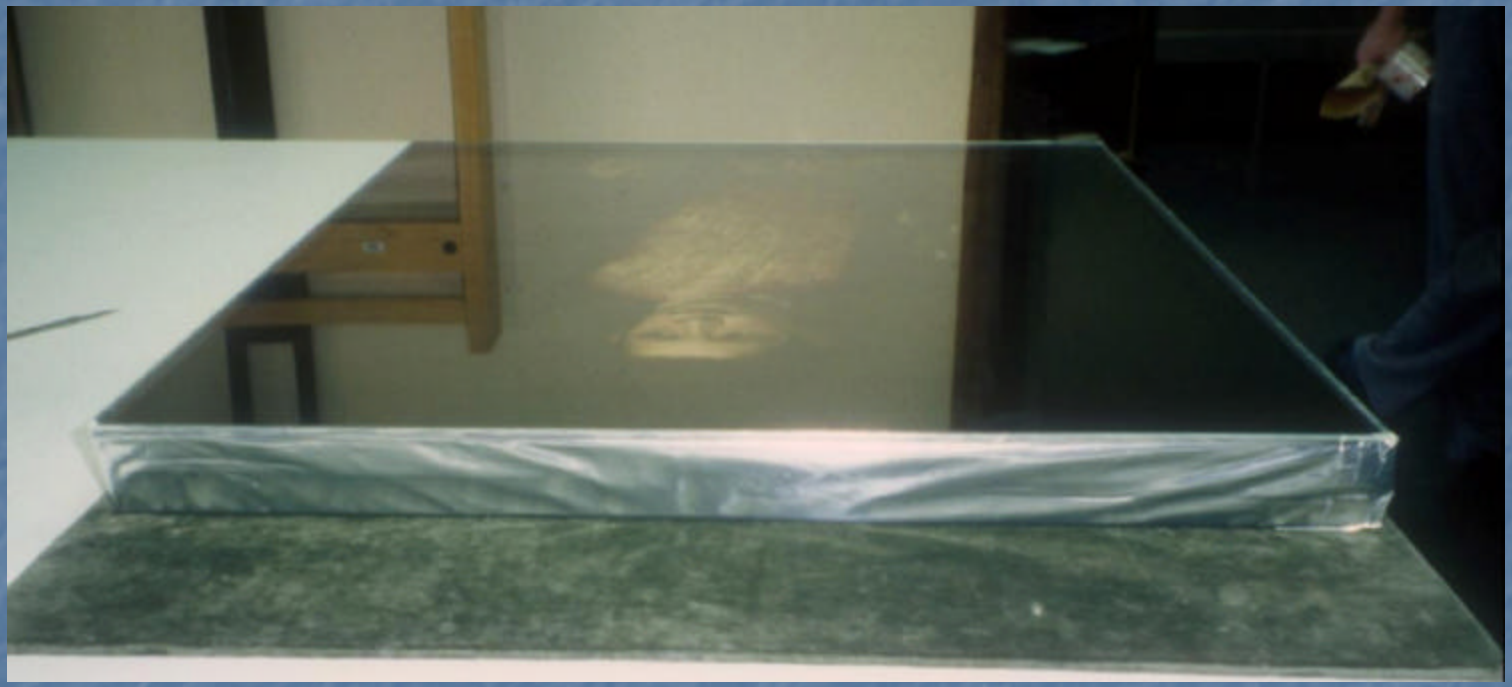
- 3M **Transfer Adhesives or Tape**
  - # 908 or #415
  - Acrylic adhesive
  - Acid Free

Microclimate Packages



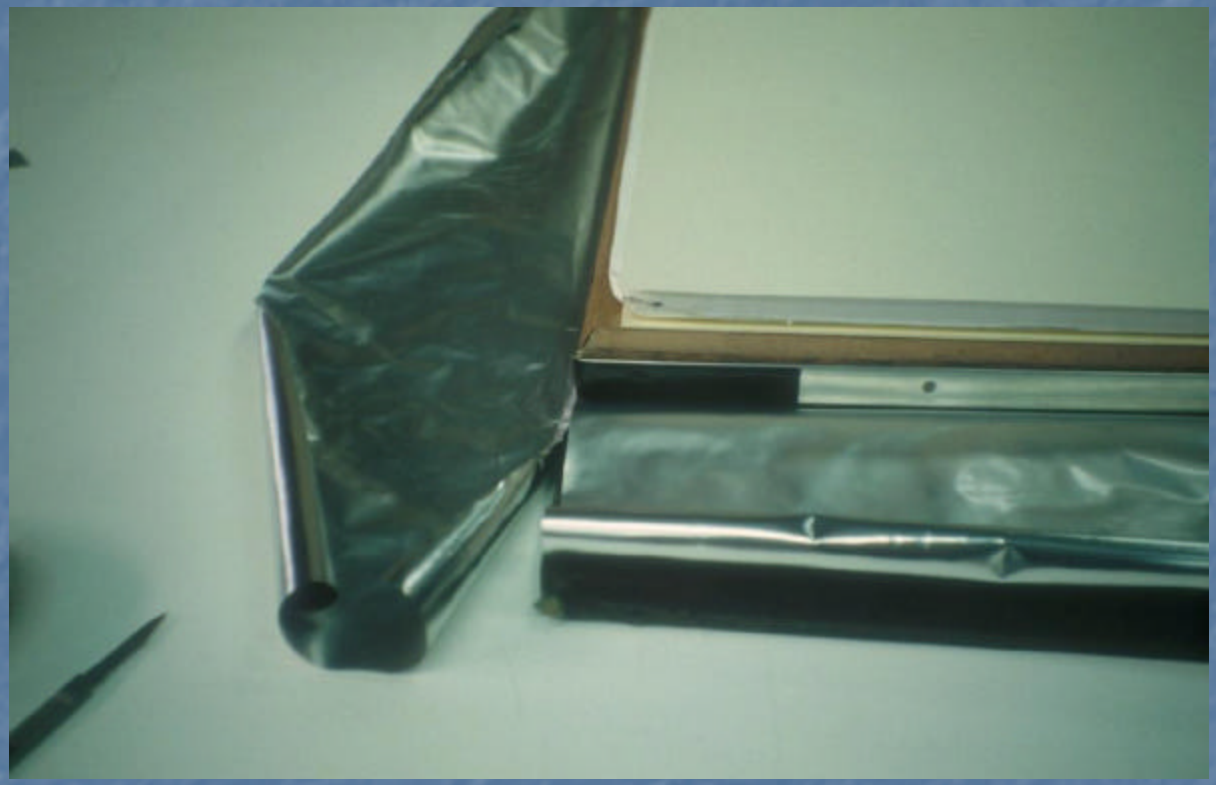
Titian
Ranuccio Farnese, 1542
National Gallery of Art

Microclimate Packages



Titian
Ranuccio Farnese
1542

Microclimate Packages



Titian
Ranuccio Farnese
1542

Raphael
The Niccolini-Cowper Madonna, 1508
oil on panel, 31 3/4 x 22 5/8 in.

Microclimate Packages

Microclimate Packages

Microclimate Packages

Microclimate Packages

Microclimate Packages

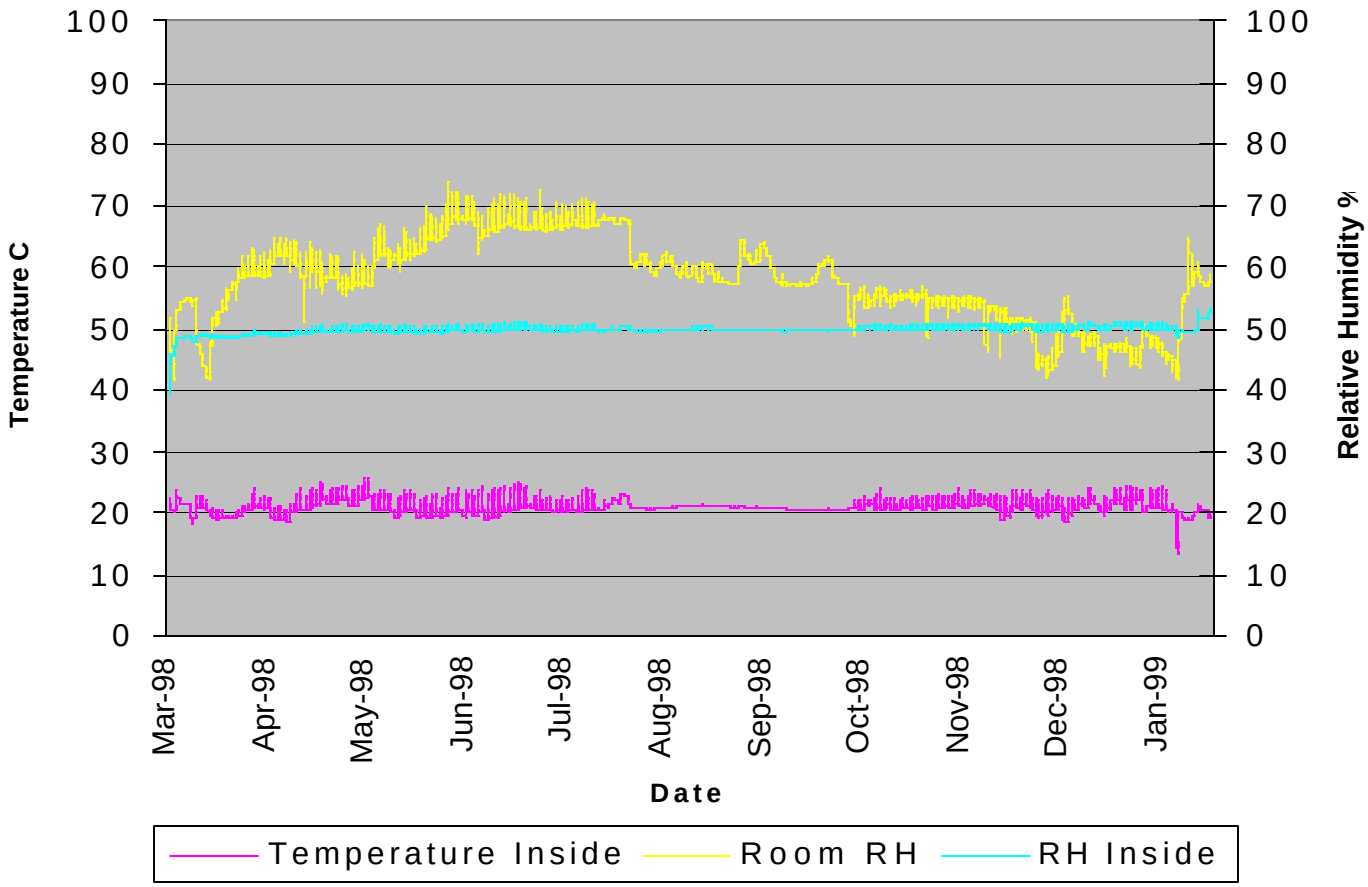
Microclimate Packages

Lorenzo Lotto
Saint Catherine, 1522
oil on panel 22 1/2 x 19 3/4 in.

Lorenzo Lotto

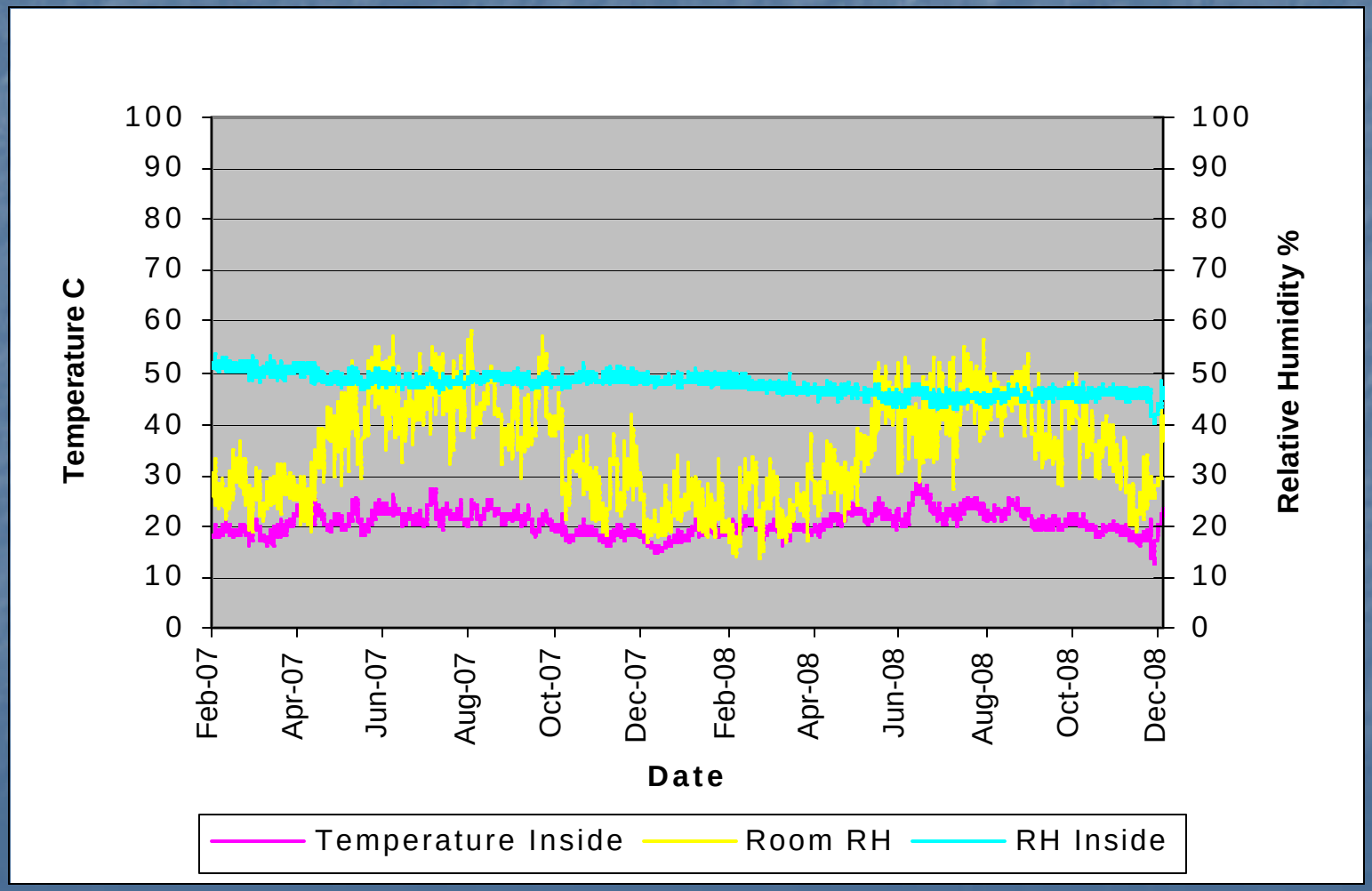
Saint Catherine, 1522

oil on panel, 22 1/2 x 19 3/4 in.)



Robert Henri
Catharine, 1913
oil on canvas 24 x 20 1/16 in.

Robert Henri American
Catharine, 1913
oil on canvas, 24 x 20 1/16 in.

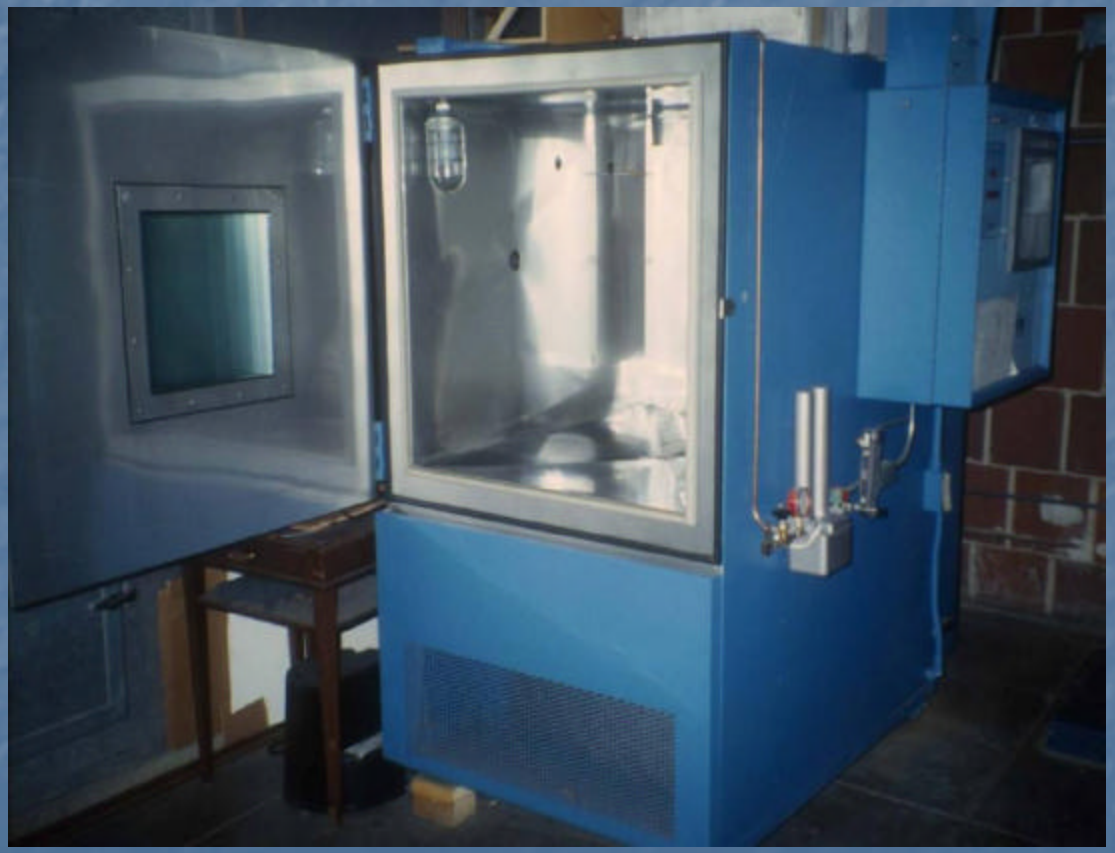


Transport

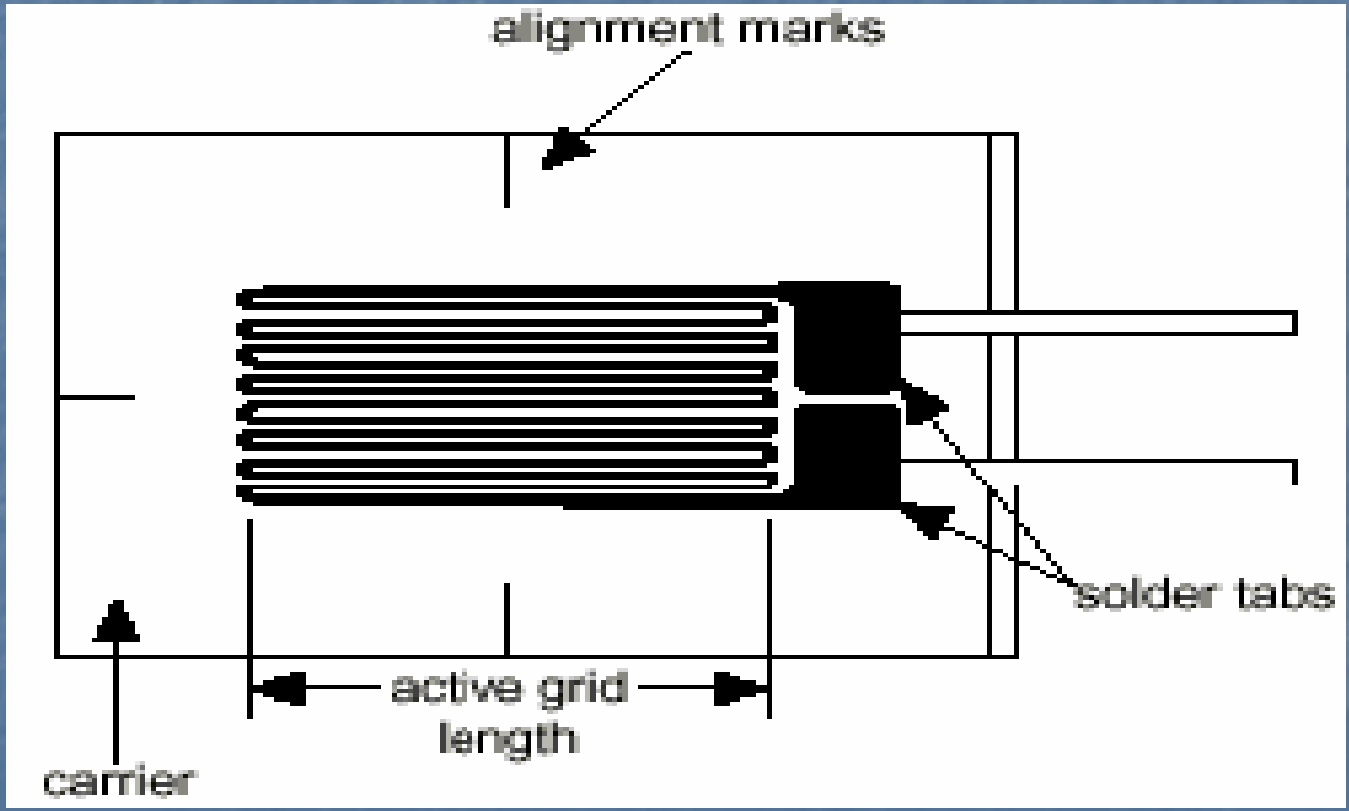
Transport

Would you ship this today?

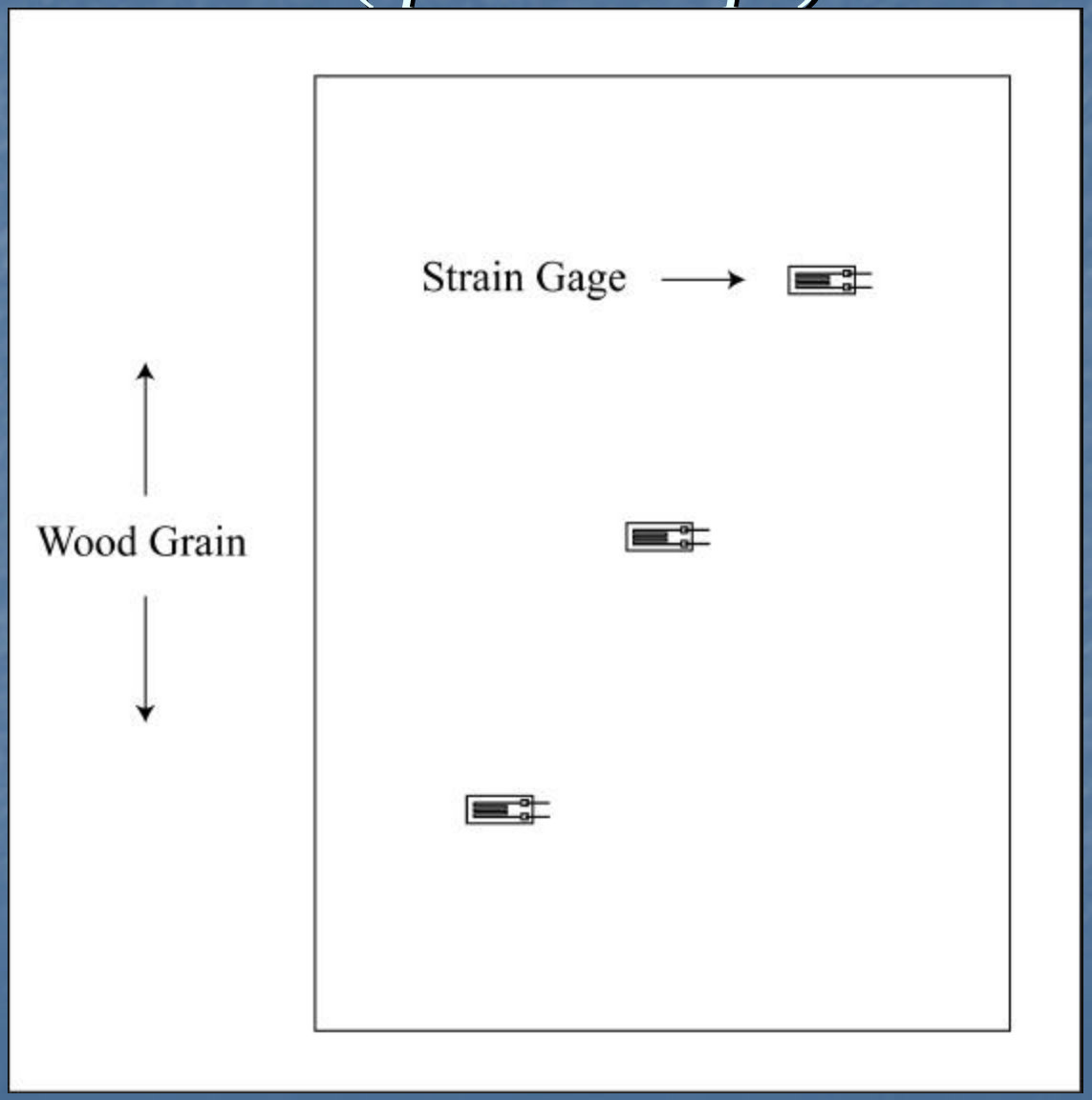
Environmental Chamber



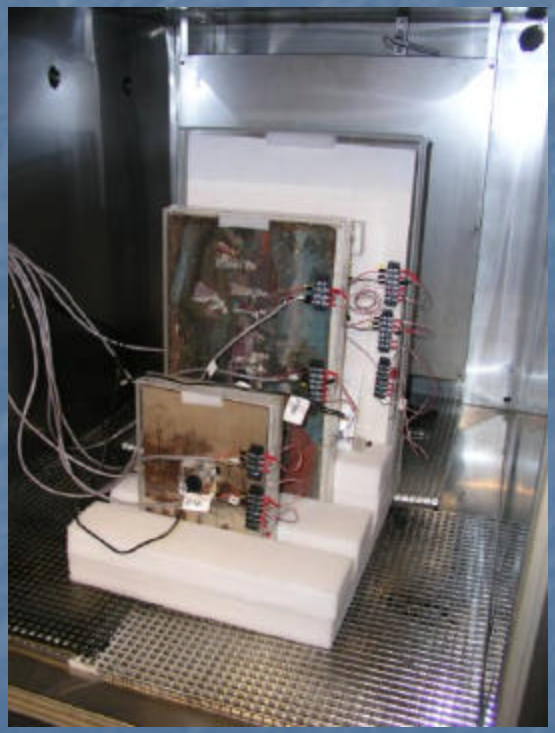
Strain Gage



Quarter Sawn Panels (*quercus sp.*)



Strain Gage



Strain Gage

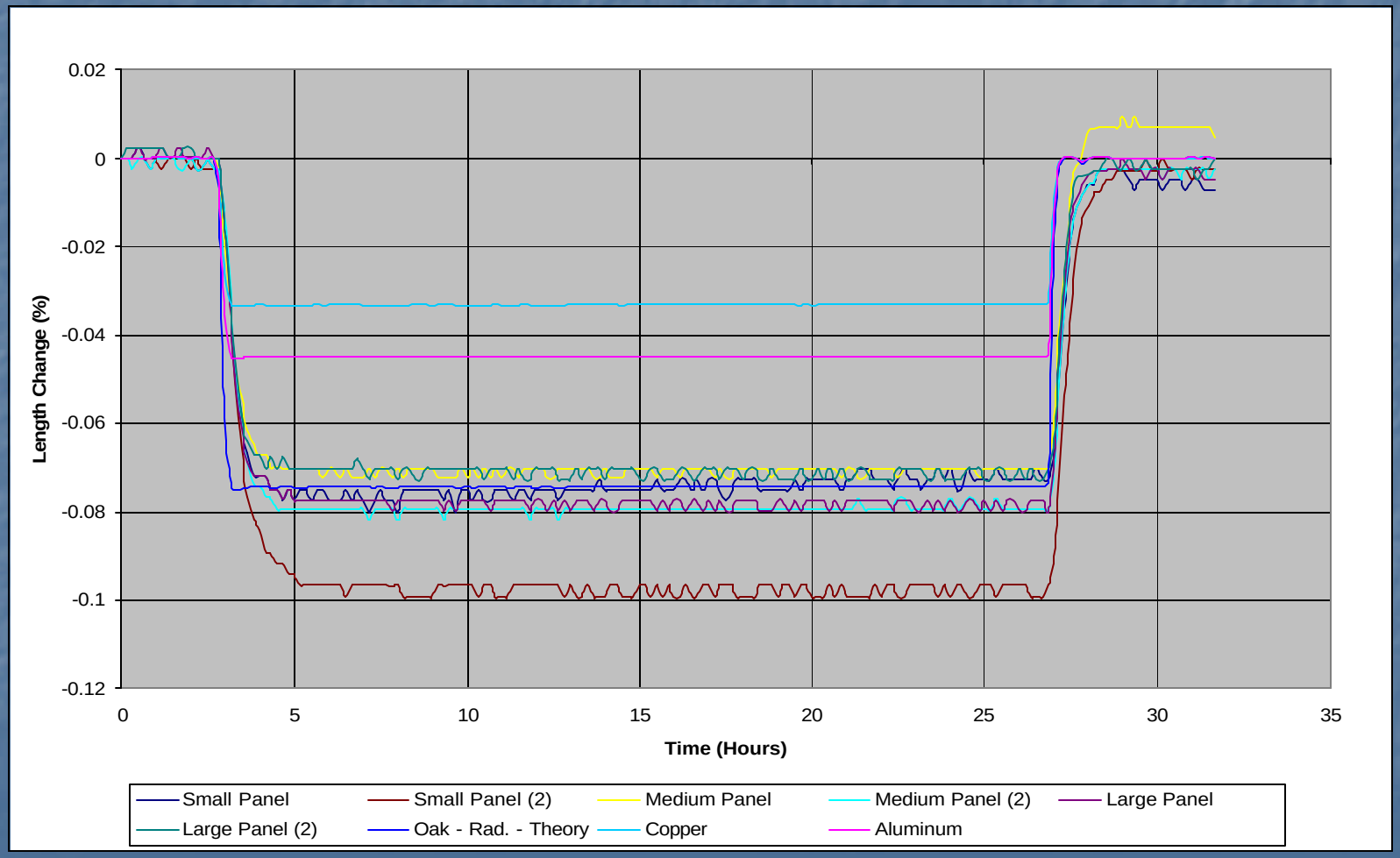
- Advantages
  - Measure small dimensional changes
  - Dynamic measurement
  - Relatively inexpensive
- Disadvantages
  - Localized measurement
  - Must attach to the surface

Temperature

Material	Linear Thermal Expansion Coefficient (10^{-6} per °C)
White oak, *Quercus alba,* longitudinal	0.3
White oak, *Quercus alba*, radial	32
White oak, *Quercus alba*, tangential	40
Oil paint, white lead *	44
Oil paint, Naples yellow *	29
Copper	17
Aluminum T-2024	23

* Data provided by M. Mecklenburg

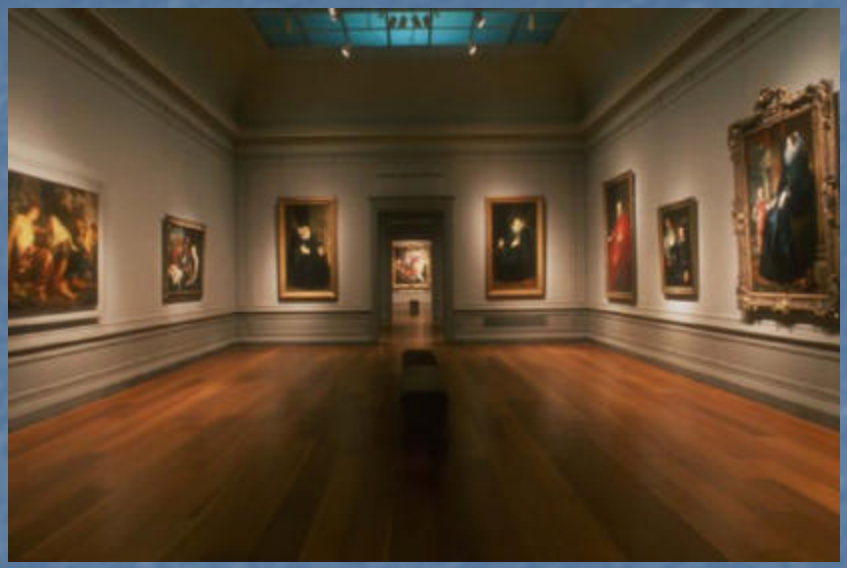
White Oak Panels with no Silica Gel
No Insulation
20°C to 0°C to 20°C



= change from 50% to 47% RH @ 20°C

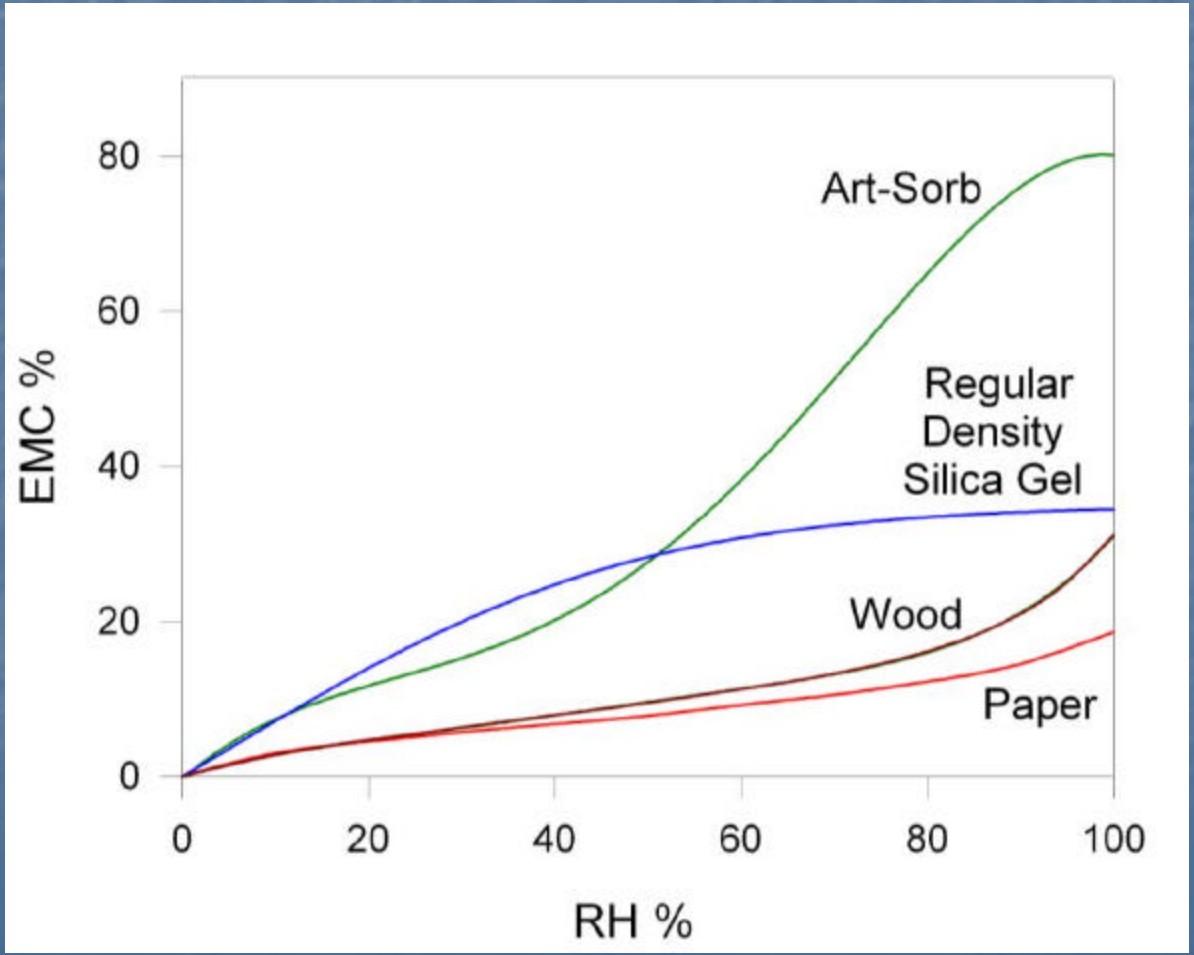
Relative Humidity (EMC)

Moisture content of air affects paintings ⇨

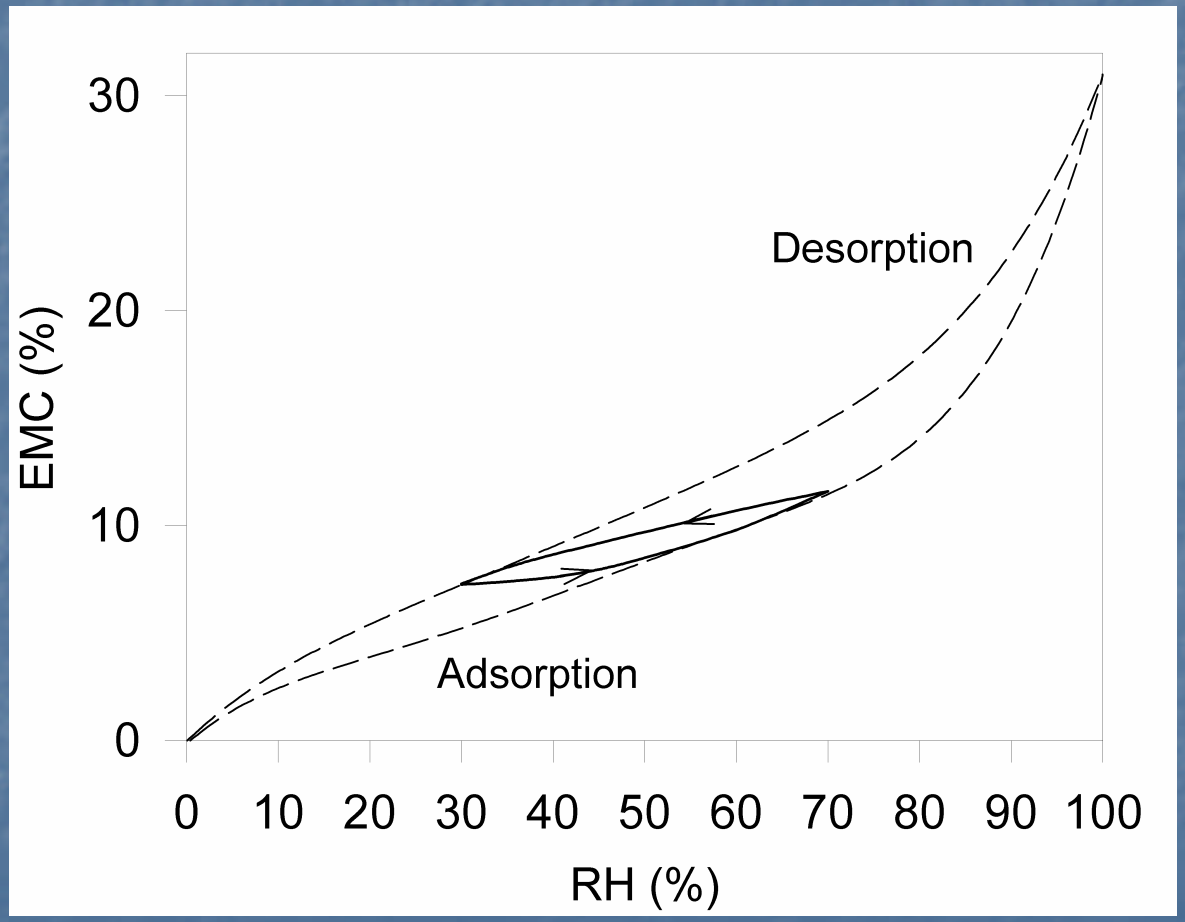


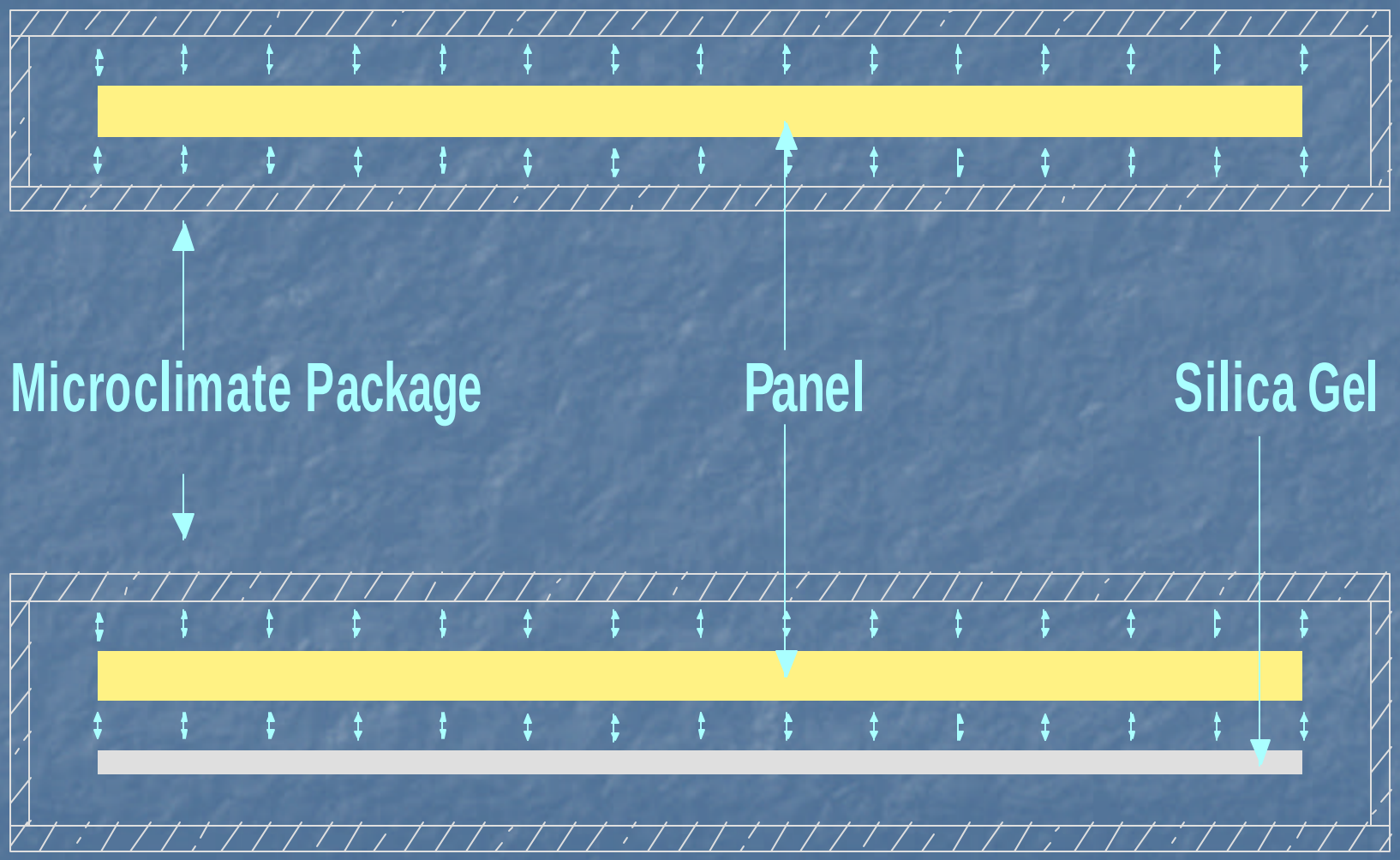
Moisture content of painting affects air ⇨

Equilibrium Moisture Content of Materials

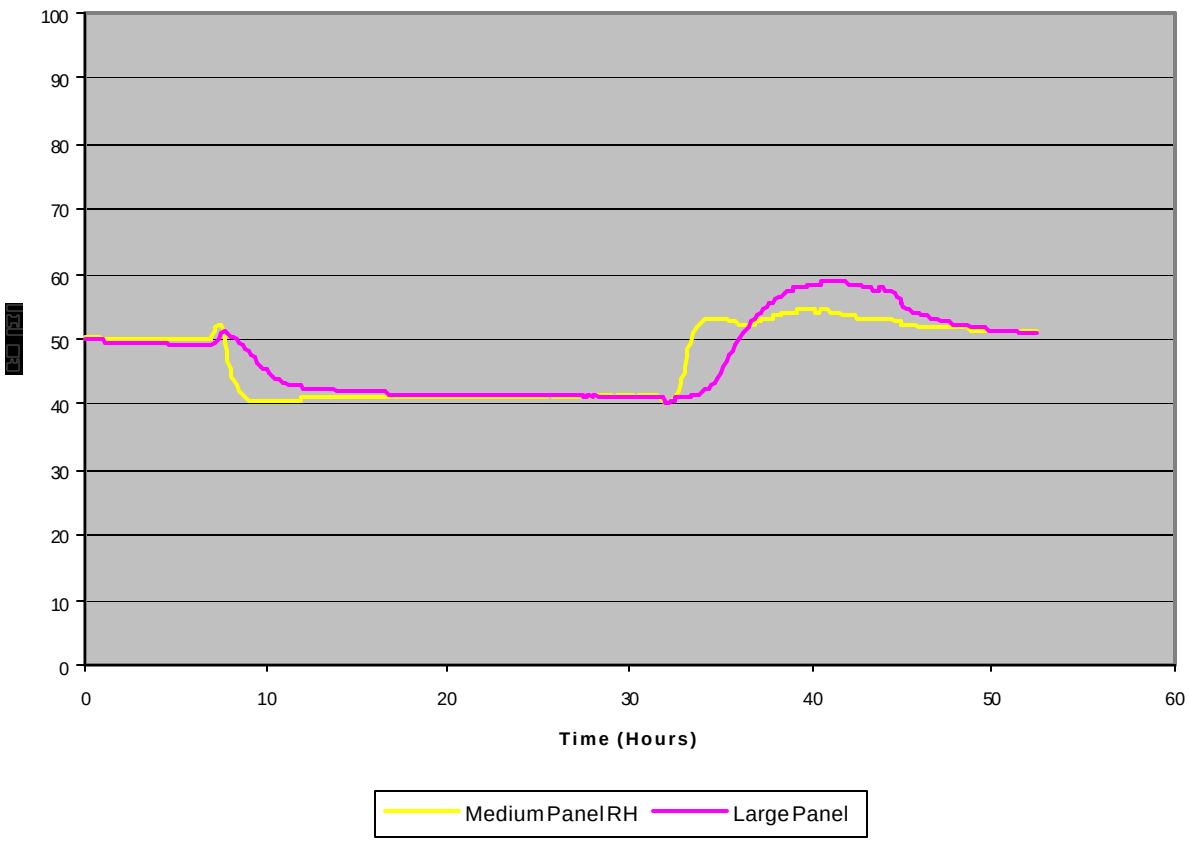


Hysteresis

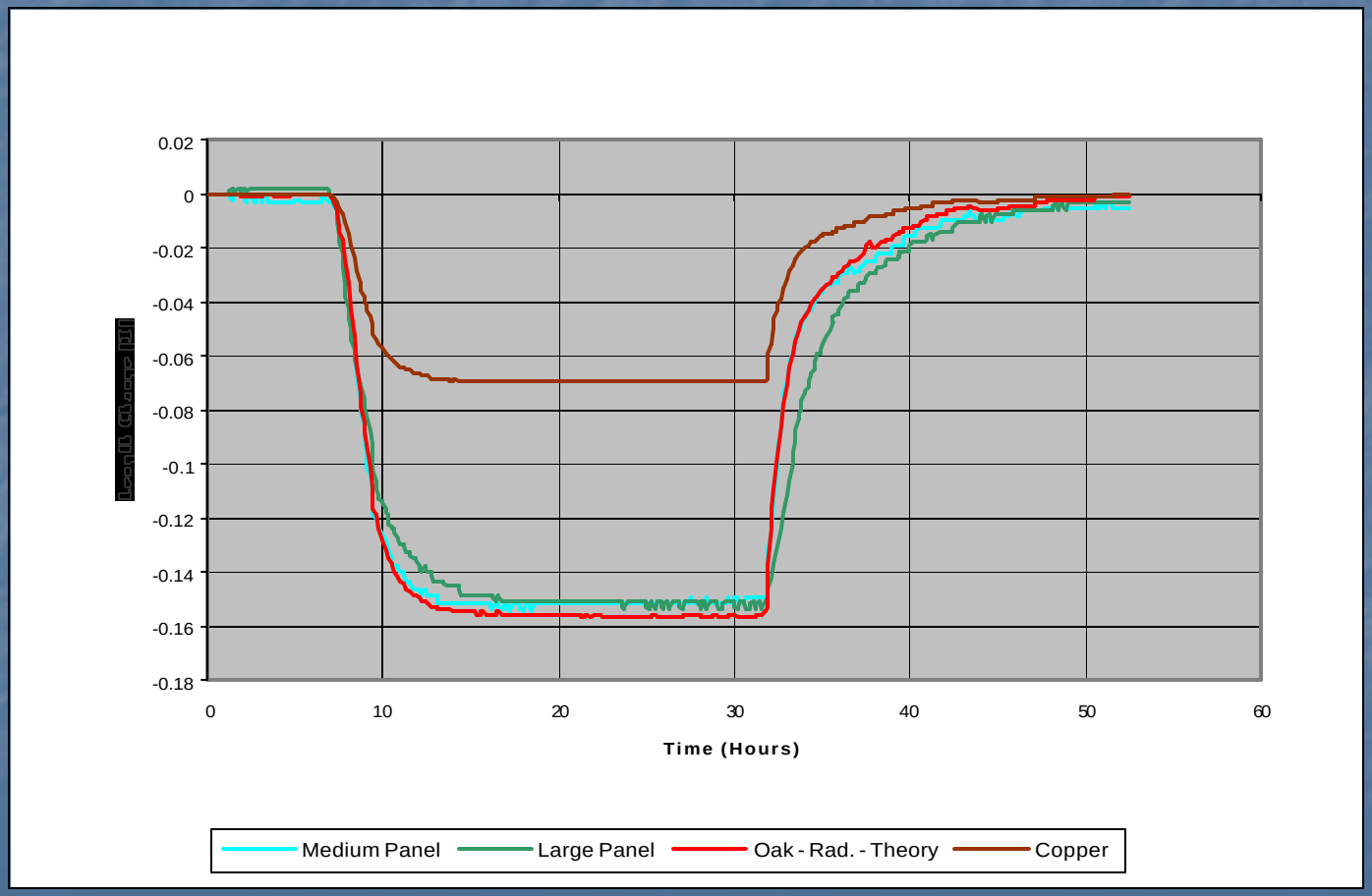

30
20
10
0
EMC (%)
Desorption
Adsorption
0
10
20
30
40
50
60
70
80
90
100
RH (%)


Microclimate Package
Panel
Silica Gel

White Oak Panels
Medium Panel with Rhapid Gel
Large Panel with Regular Density Silica Gel
Insulated Case
20°C to -20°C to 20°C

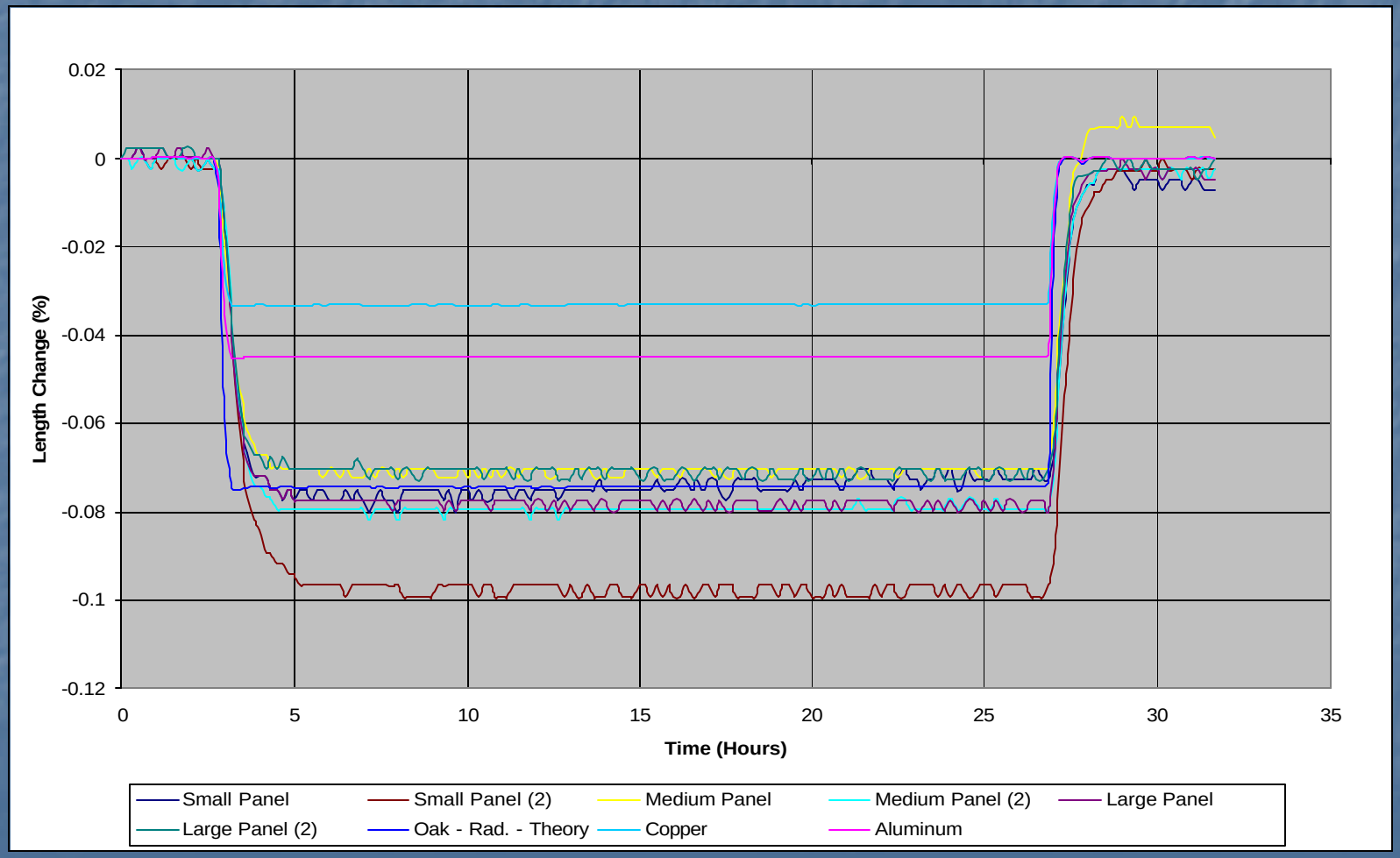


White Oak Panels
Medium Panel with Rhapid Gel
Large Panel with Regular Density Silica Gel
Insulated Case
20°C to -20°C to 20°C



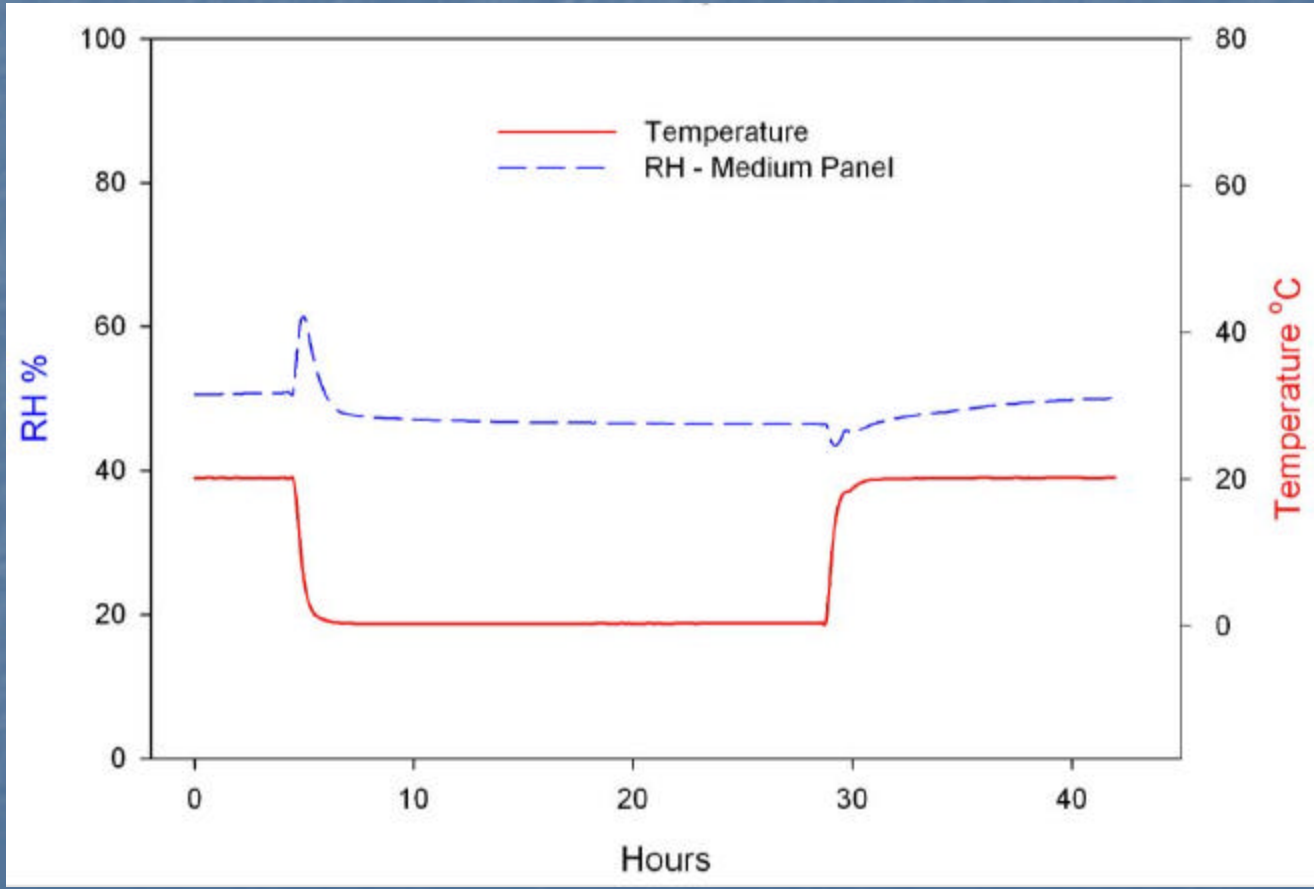
= change from 50% to 44% RH @ 20°C

White Oak Panels with no Silica Gel
No Insulation
20°C to 0°C to 20°C

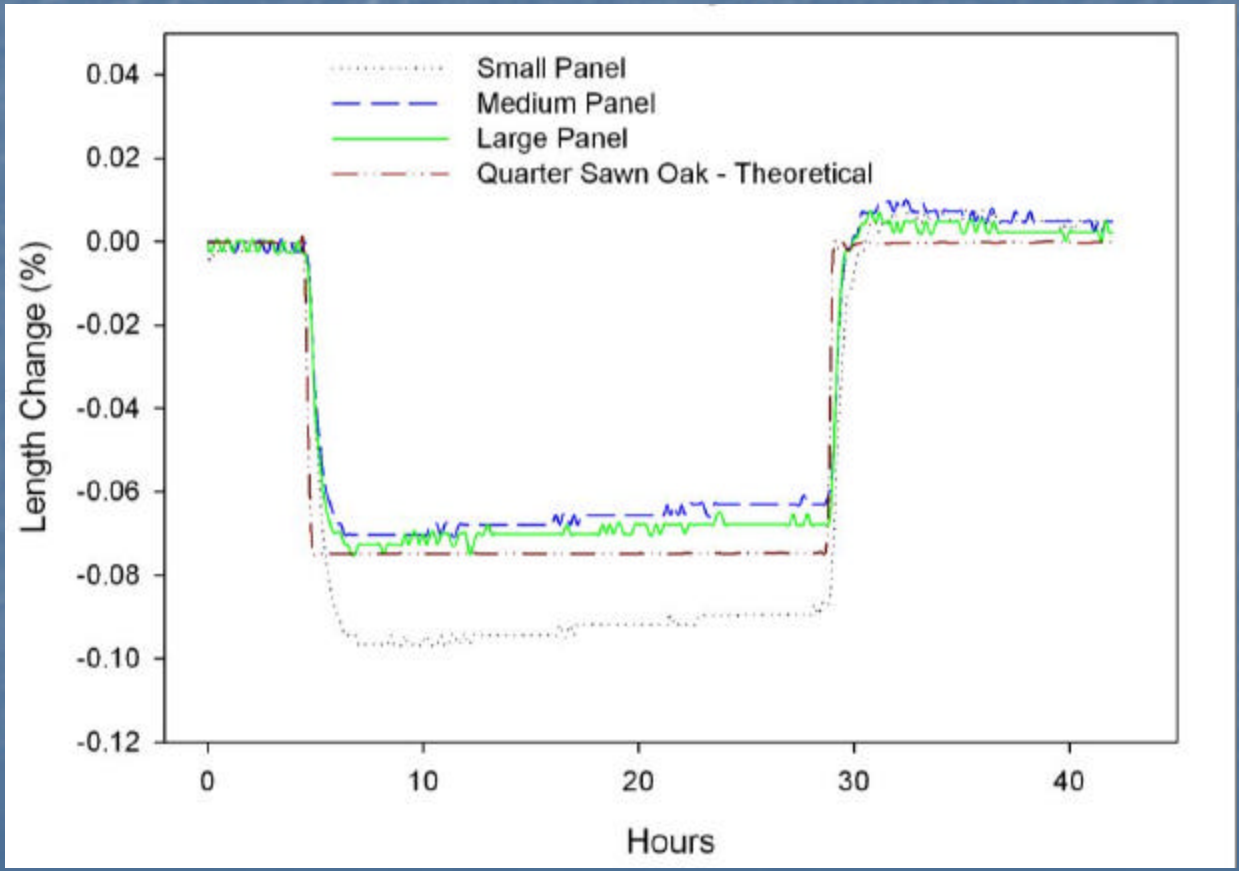


= change from 50% to 47% RH @ 20°C

White Oak Panel
Medium Panel with Art Sorb
20°C to -20°C to 20°C



White Oak Panel
Medium Panel with Art Sorb
20°C to -20°C to 20°C

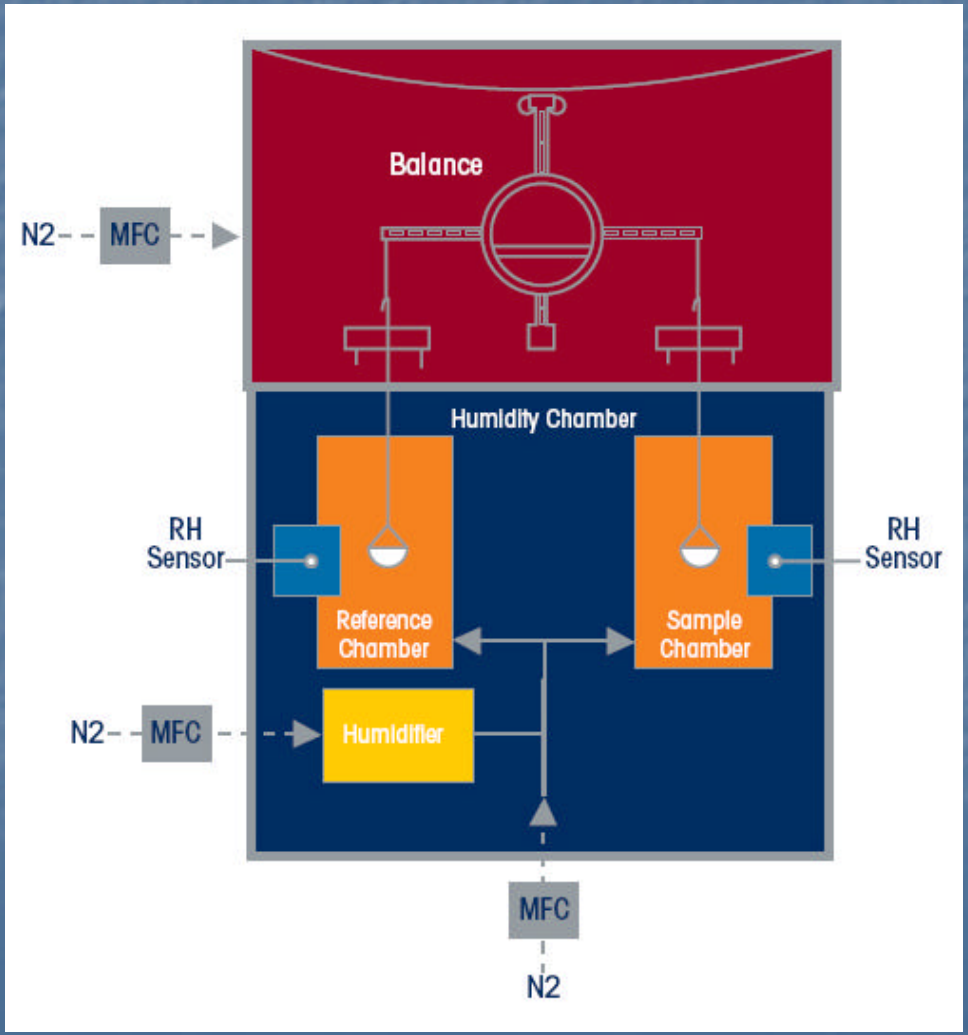


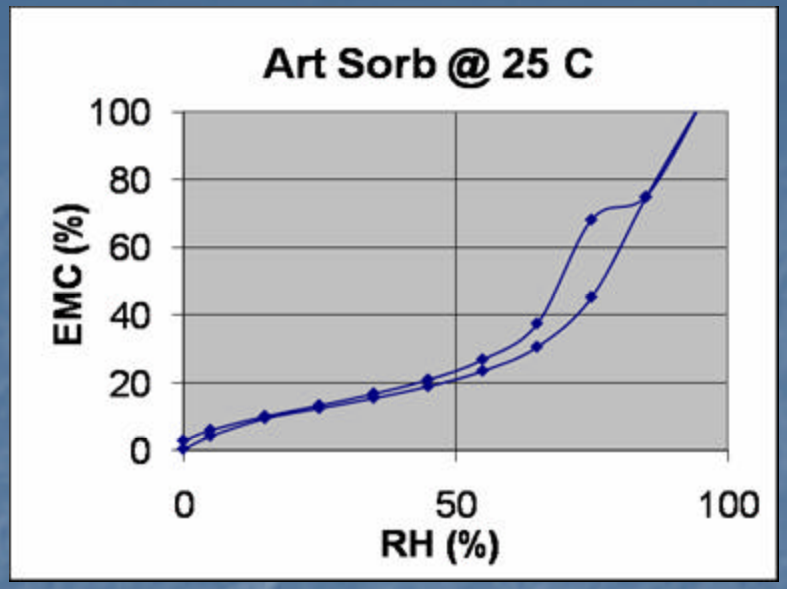
Q5000 SA
TA Instruments, Inc.

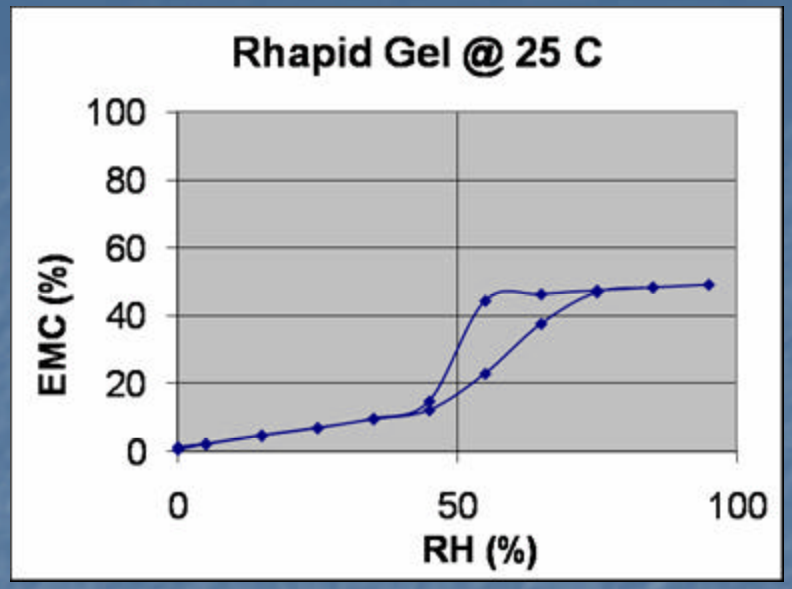
High performance water vapor analysis

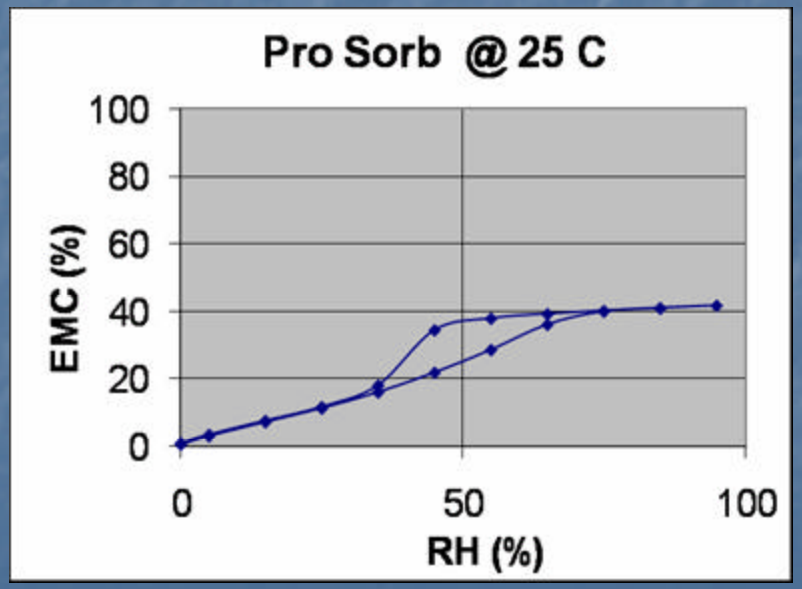
Q5000 SA
TA Instruments, Inc.

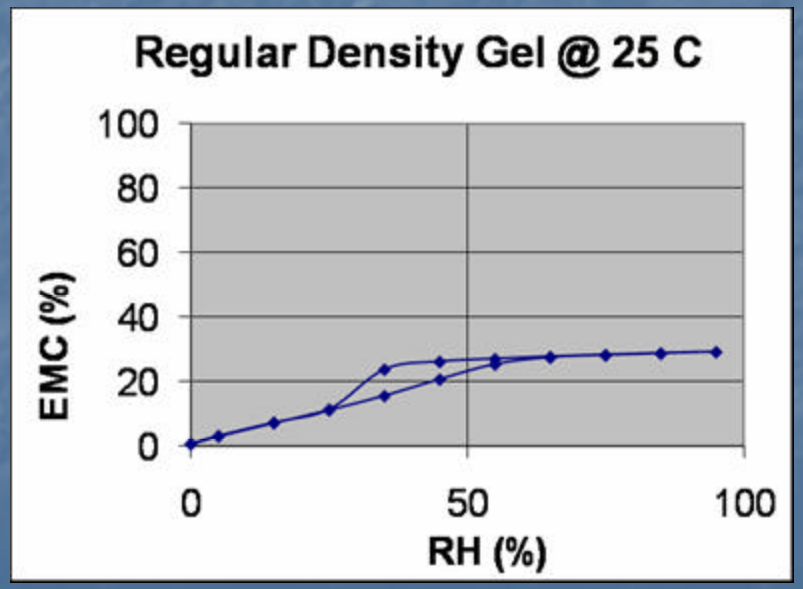
Q5000 SA

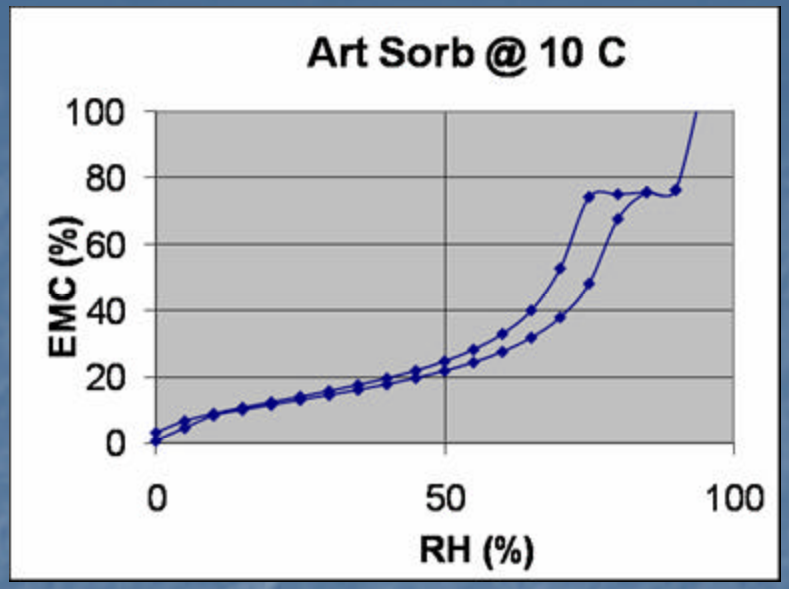

Balance
N2
MFC
Humidity Chamber
RH Sensor
RH Sensor
Reference Chamber
Sample Chamber
N2
MFC
Humidifier
MFC
N2

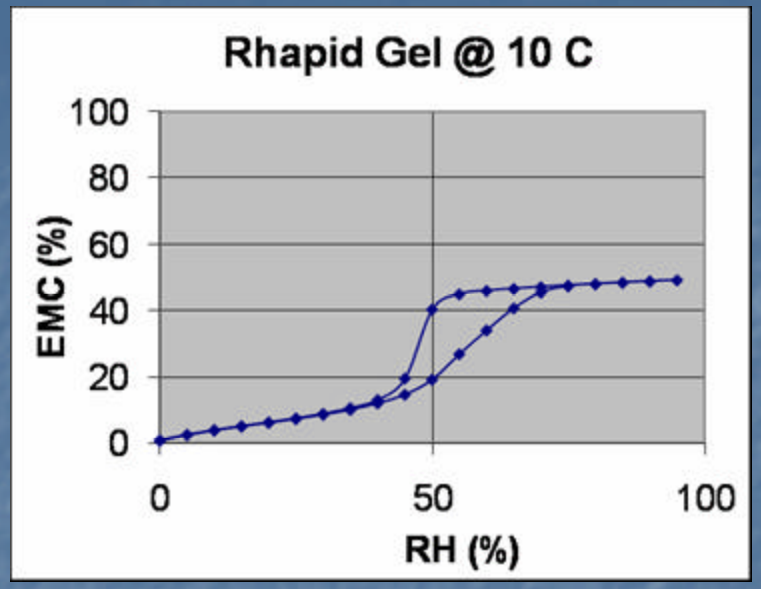

Art Sorb @ 25 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)

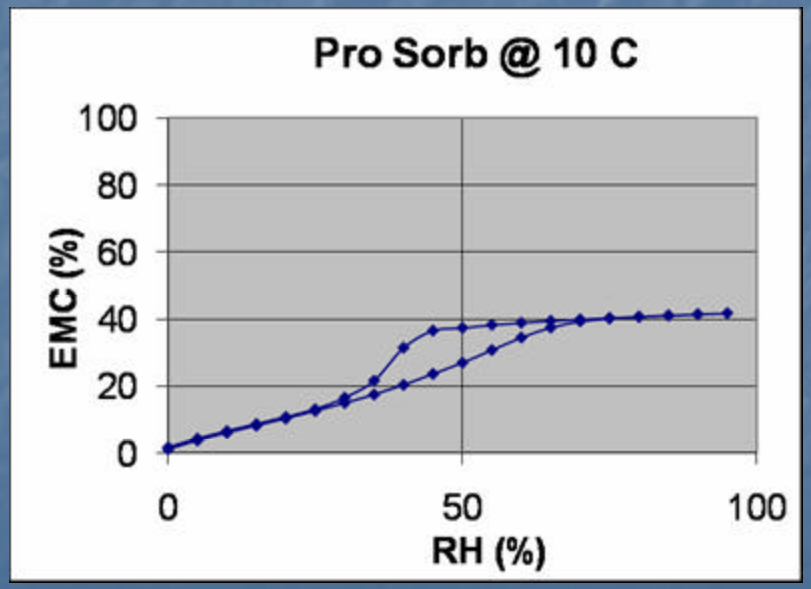

Rhapid Gel @ 25 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)

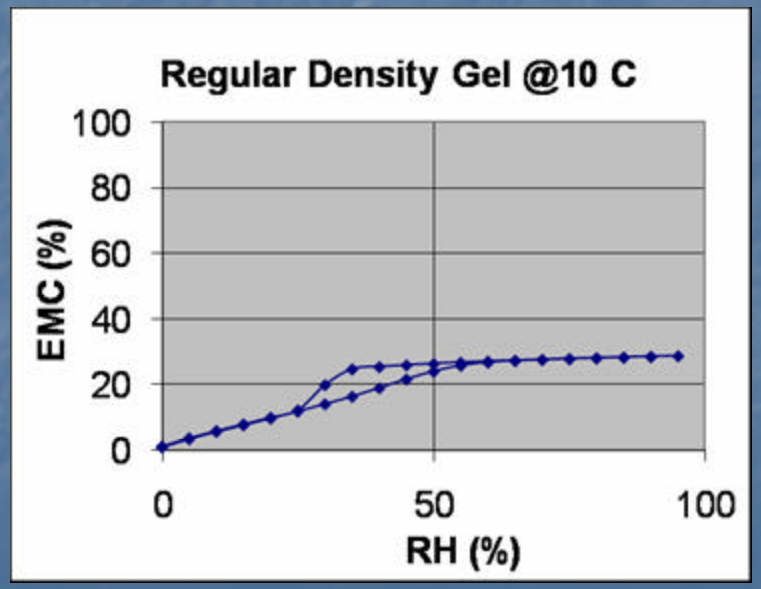

Pro Sorb @ 25 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)

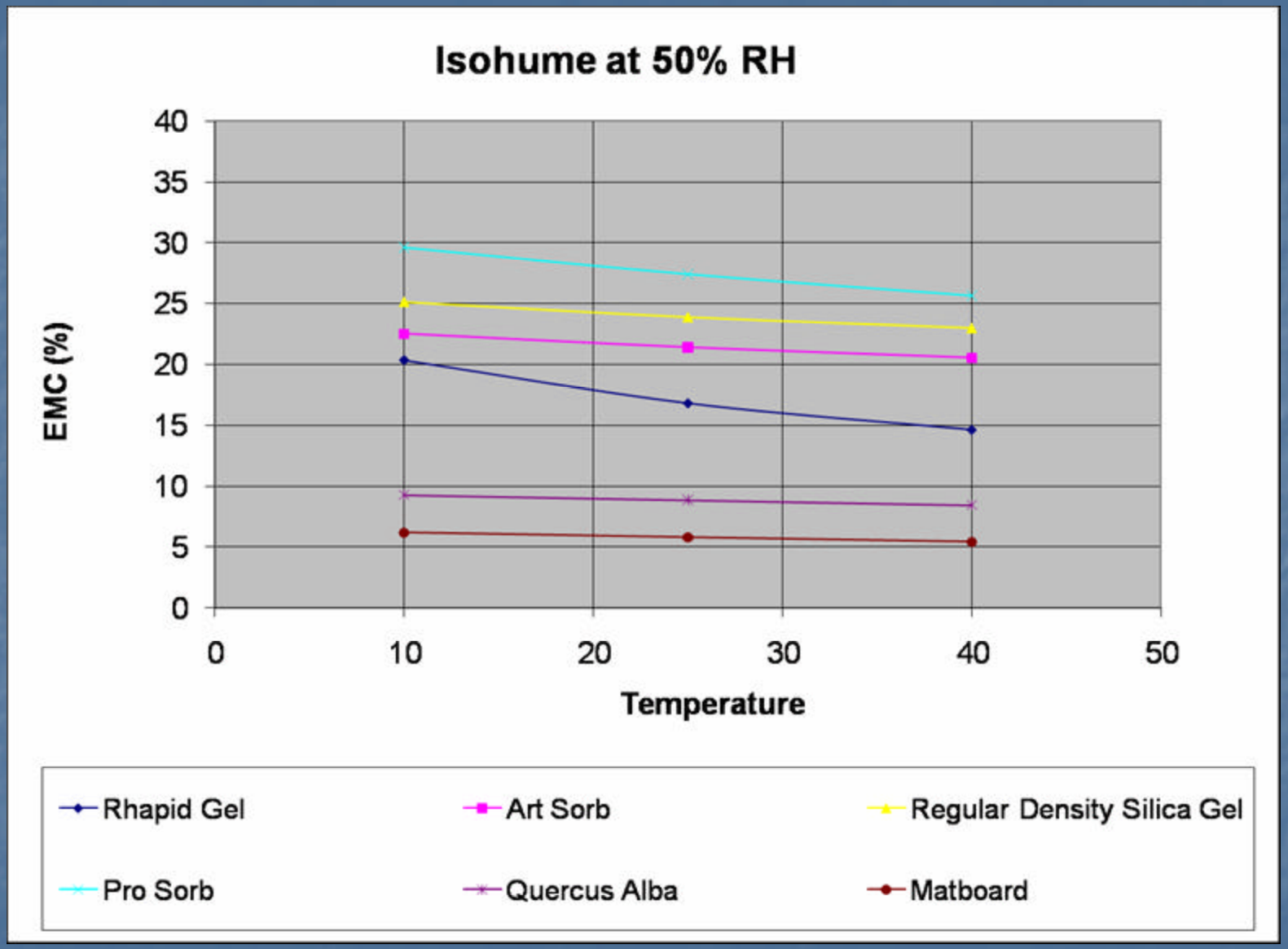

Regular Density Gel @ 25 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)

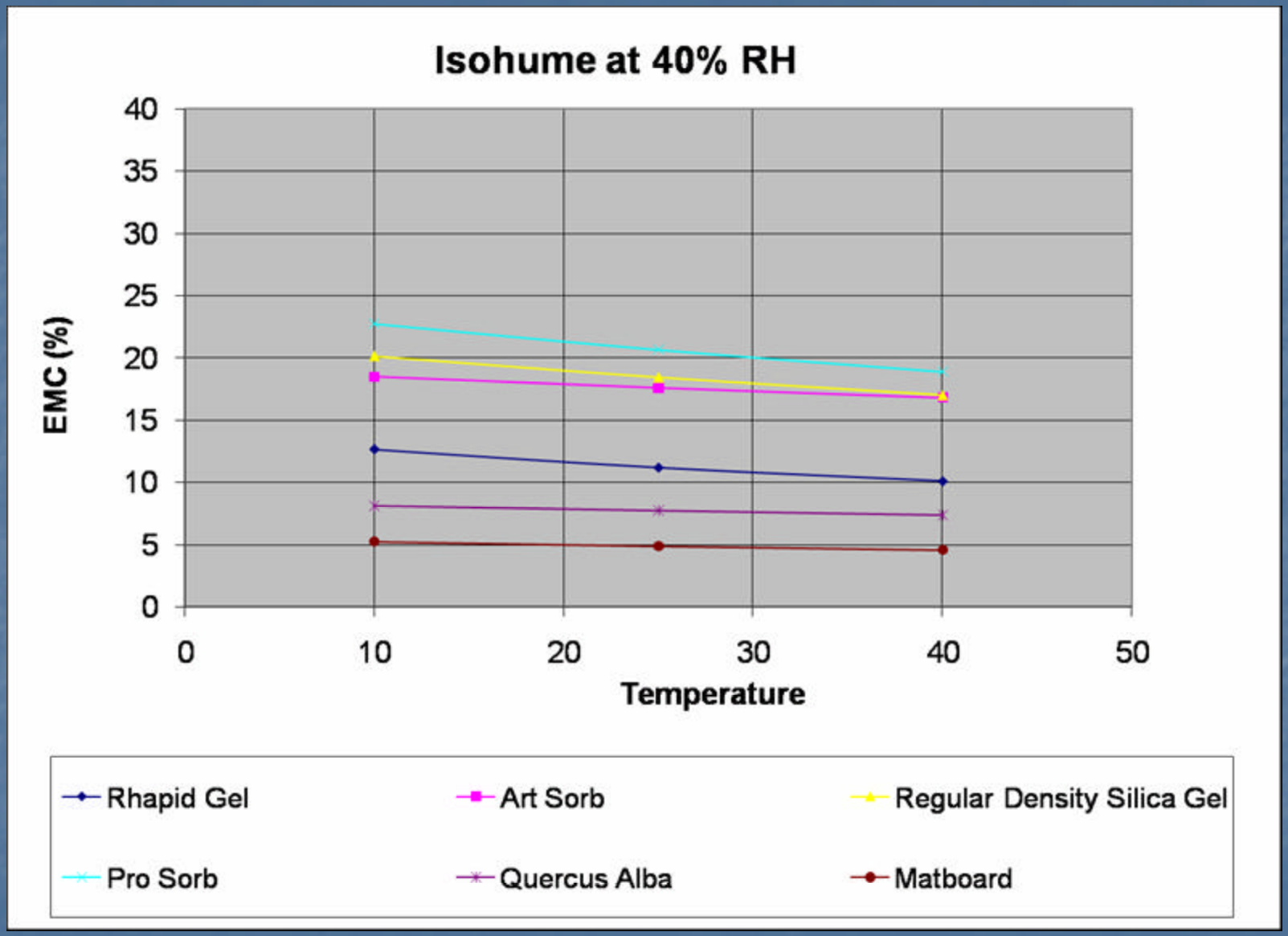

Art Sorb @ 10 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)

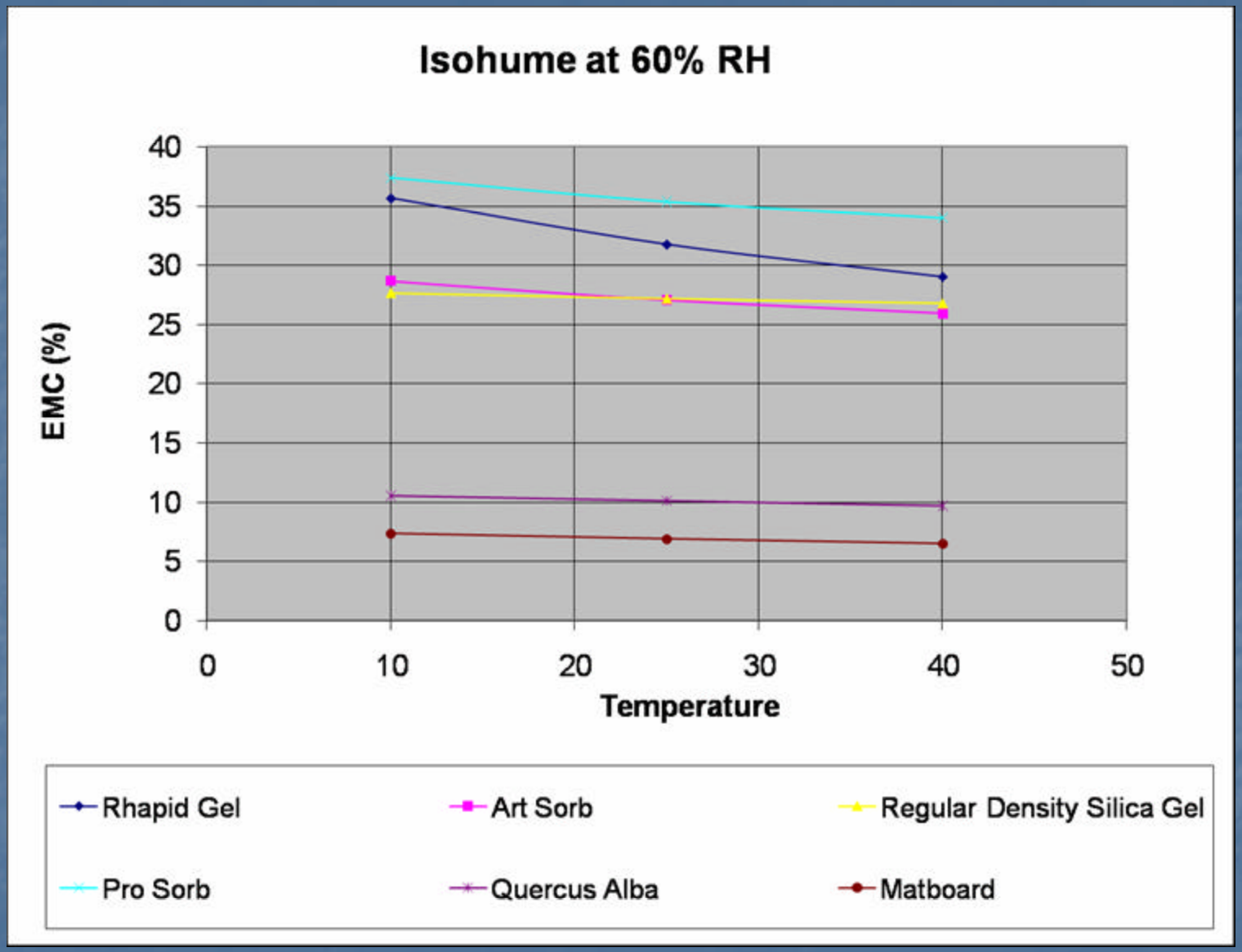

Rhapid Gel @ 10 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)


Pro Sorb @ 10 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)


Regular Density Gel @10 C
EMC (%)
100
80
60
40
20
0
0
50
100
RH (%)


Isohume at 50% RH
EMC (%)
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
Temperature
Rhapid Gel
Art Sorb
Regular Density Silica Gel
Pro Sorb
Quercus Alba
Matboard


Isohume at 40% RH
EMC (%)
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
Temperature
Rhapid Gel
Art Sorb
Regular Density Silica Gel
Pro Sorb
Quercus Alba
Matboard


Isohume at 60% RH
EMC (%)
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
Temperature
Rhapid Gel
Art Sorb
Regular Density Silica Gel
Pro Sorb
Quercus Alba
Matboard

Propaint Project

Propaint.nilu.no

Conclusions

- Microclimate packages are beneficial
- Silica gel is not required
  - Well-made microclimate package
  - Moderate ambient conditions
- Silica gel can improve performance
  - If significant leakage
  - Does not have an adverse affect
  - Thermal response of wood is more significant

Thanks for Listening!