

Kinetics of formaldehyde purification by PREGYROC AIR® plasterboards



Dr Fabien Squinazi
Doctor biologist

Mickaël Jahan
Homologation and Testing Manager
Siniat France

Exposure to formaldehyde

- A chemical that is ubiquitous in indoor environments
- A recognized health impact
- Several fields of intervention
 - ✓ control of emission sources
 - ✓ the renewal of the air of the premises
 - ✓ the use of air purification systems

⇒ **Object of this study** (Full study report from Dr Squinazi available on <https://www.siniat.fr/fr-fr/votre-besoin/qualite-de-l-air>)

- Purification efficiency of CAPT'AIR® technology at real scale
 - ✓ In the presence of a source of formaldehyde
 - ✓ Over the long term (several months)
 - ✓ In end use conditions
 - ✓ With paint's finishing treatment

Siniat CAPT'AIR® technology for plasterboards

Solutions for all construction sites



A wide range of products

	STANDARD PREGYPLAC AIR 	HIGH HARDNESS PREGYROC AIR®  	ACOUSTIC PREGYTWIN AIR®  	INSULATION PREGYTHERM / PREGYMAX  
BA 13 mm	✓	✓		✓
BA 18 mm	✓	✓		
BA 25 mm			✓	

Result of the first « laboratory » study (2011)

CSTB Test in 2011 (in test chamber according to standard NF EN ISO 16000-9: August 2006)

- PREGYROC AIR® has a formaldehyde purification capacity of 79%
 - ✓ for a concentration of $58 \pm 1 \mu\text{g}/\text{m}^3$
 - ✓ Surface of the sample tested: **0,6 m²**
 - ✓ Volume of the test chamber: **1 m³**
 - ✓ Duration of the test: **2 days**

Composition of the test cells for the two « real scale » studies (2013 & 2015) France- Carpentras (84)

	Goal	Cell 1	Cell 2	Cell 3 : control
Study 1	1) Efficiency measurement of CAPT'AIR® 2) Release	-PREGYROC AIR® (18 mm) -CAPT'AIR® Technology -Unpainted boards	-PREGYPLAC (18 mm) -Standard plasterboard -Unpainted boards	-Aluminium coated boards -0% captation
Study 2	1) Influence of paints on CAPT'AIR® technology efficiency 2) Release	-PREGYROC AIR® (18 mm) -With « anti-voc » satin paint	-PREGYROC AIR® (18 mm) -With matt paint	-PREGYROC AIR® (18 mm) -Unpainted boards

Description of the test cells



3 cells:

- Volume : 25,20 m³ (4,20 x 2,40 x 2,50 m)
- Mechanical ventilation system (0,5 à 0,6 vol/h)
- PVC watertight entrance door (0,90 x 2,15 m)
- PVC watertight window (0,40 x 0,60 m)
- Guide rail (height 1,4 m) for introduction of passive sampling tubes
- Skylight (0,15 x 0,30 m)
- Floor lined with aluminium foil
- Temperature and hygrometry recording probes (height 1,6 m)

Source of formaldehyde: description



- Five chipboards (EN13986) per test cell to a height of 0,9 m
- density : 660 kg/m³ (16 mm thick)
- Total emission area of 16 m² for a total weight of 170 kg
- E1 class (according to EN 120): up to 8 mg of formaldehyde/100 g of board (total:13,6 g max)



Influence of temperature on woodpanels emissions

	Temperature		
	22°C	32°C	42°C
Emissions of formaldehyde	X	2X	6X

Measured as part of the study with ETHERA sensors

Measuring formaldehyde

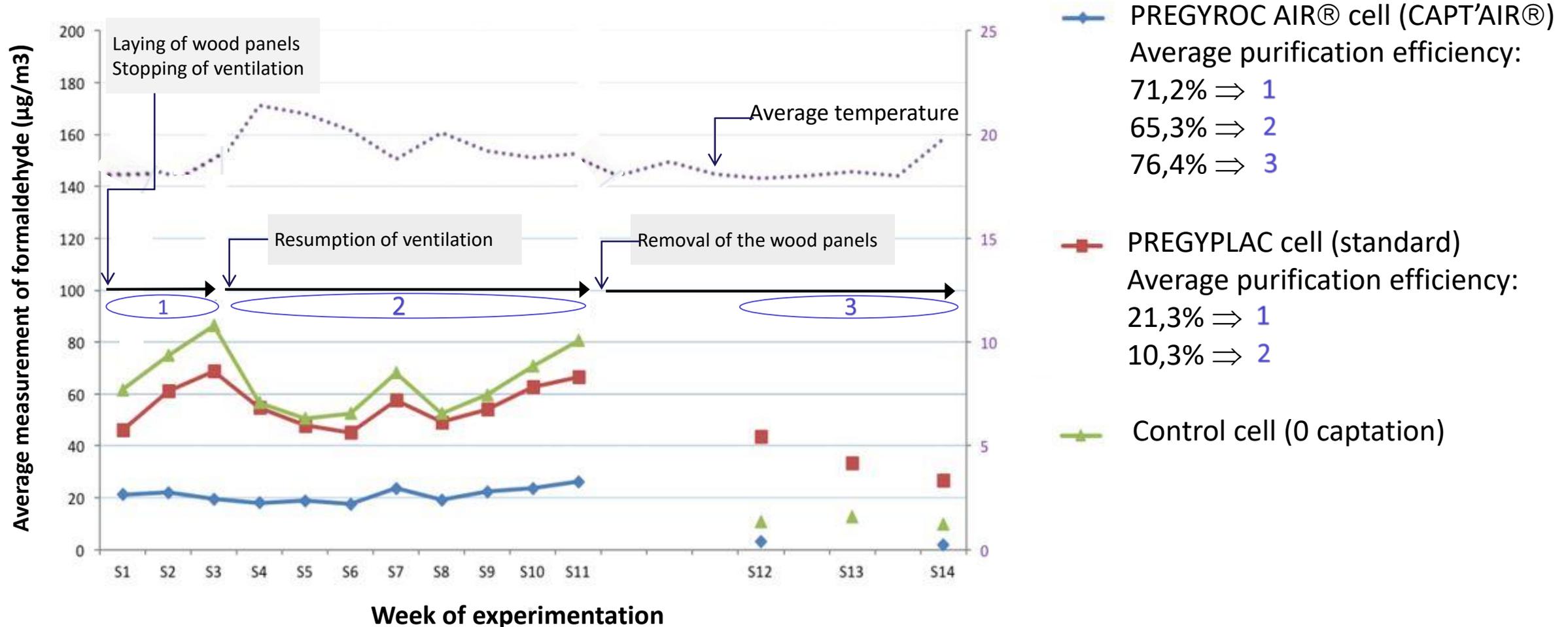


- ❑ Two passive sampling devices (Radiello® 165), changed every week and placed :
 - At the center of the cell **1**
 - Close to a wall
- ❑ Analysis according to ISO 16004 (2012) by the Laboratoire d'Hygiène de la Ville de Paris (LHVP)
- ❑ Temperature and hygrometry probes **2**

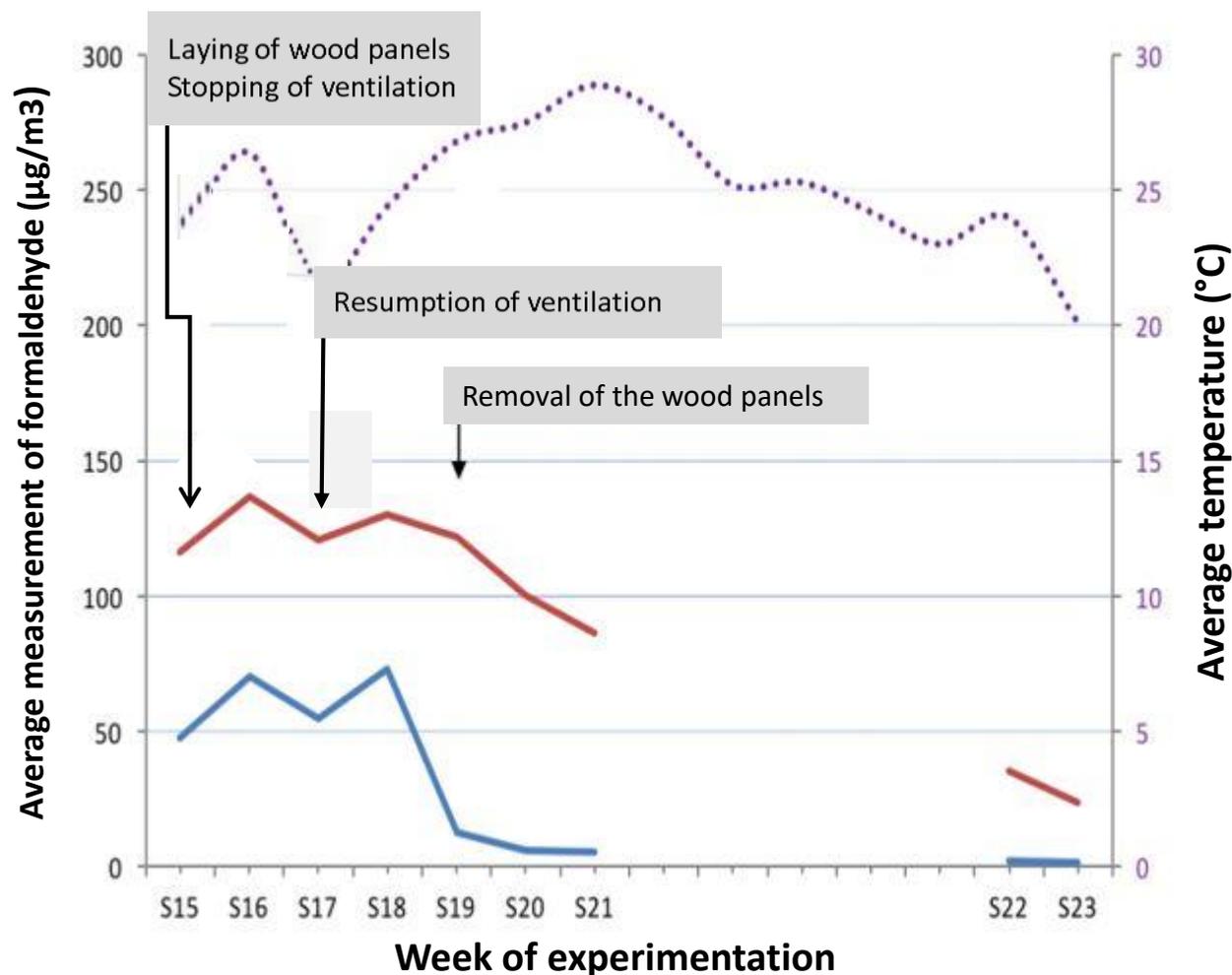
Launch of the 1st study - 2013

	Goals	Cell 1	Cell 2	Cell 3 : control
Study 1	1) Efficiency measurement of CAPT'AIR® vs Standard	- PREGYROC AIR® (18 mm) (CAPT'AIR® Technology)	- PREGYPLAC (18 mm) (Standard plasterboard)	- Aluminium coated boards (0% captation)
	2) Release	- Unpainted boards	- Unpainted boards	- Unpainted boards
Study 2	1) Influence of paints on CAPT'AIR® technology efficiency	-PREGYROC AIR® (18 mm) -With « anti-voc » satin paint	-PREGYROC AIR® (18 mm) -With matt paint	-PREGYROC AIR® (18 mm) -Unpainted boards
	2) Release			

Evolution of formaldehyde concentrations after introduction and removal of wood panels



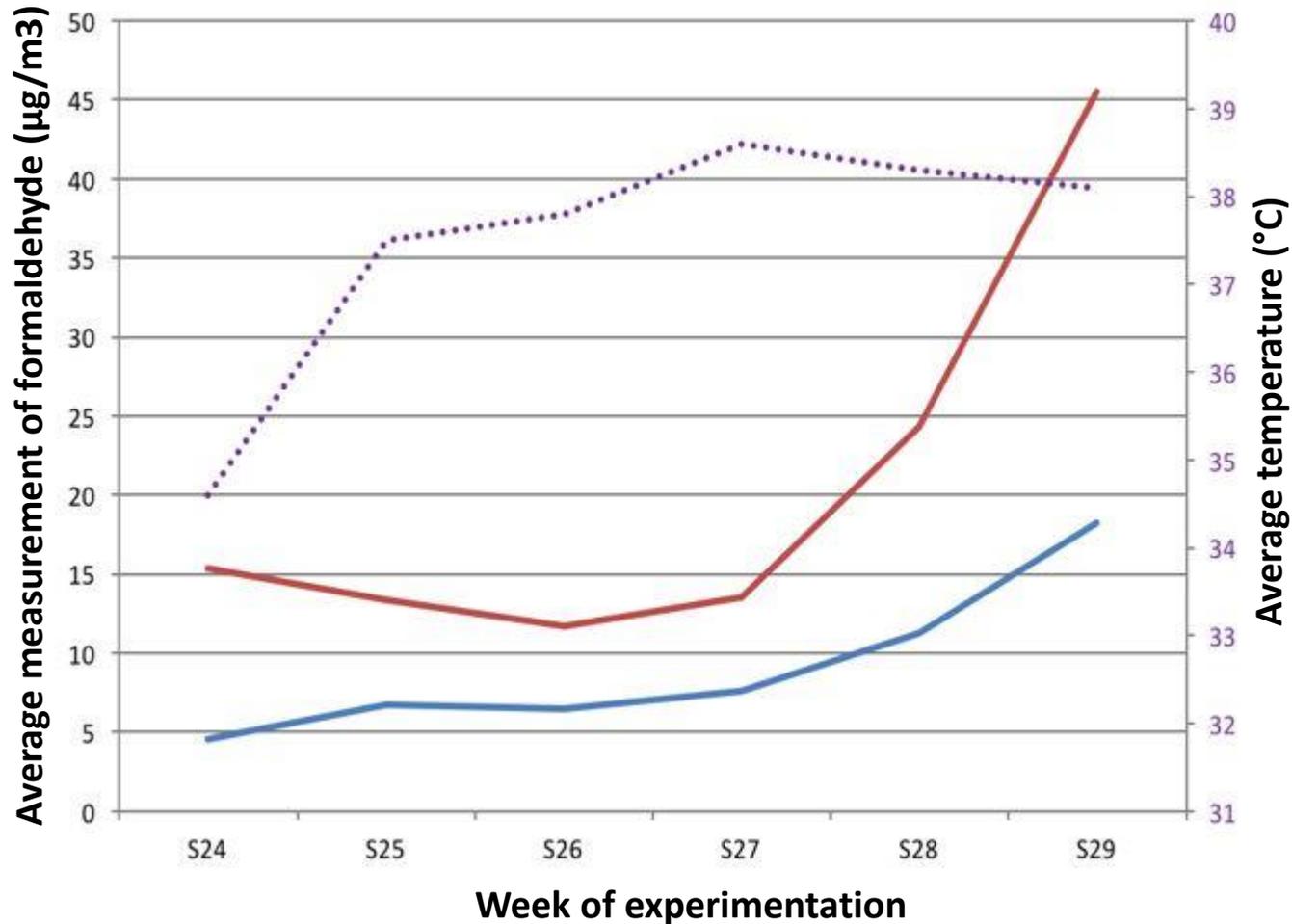
Evolution of formaldehyde concentrations after introduction of a new, more emissive batch of wood panels and a higher temperature (21,5-26,4°C)



- PREGYROC AIR® cell**
 - Higher but stable (61µg/m³) in connection with:
 - A new, more emissive batch
 - The increase of temperature (21,5-26,4°C)
 - Undetectable after removal of the woodpanels (temperature: 26,8-28,9°C)
- PREGYPLAC cell**
 - Significantly higher (126µg/m³)
 - Very slow decrease after removal of the source

	PREGYROC AIR	STANDARD
Formaldehyde concentration in presence of the source	Stable: 61µg/m ³	126µg/m ³
Formaldehyde concentration after removal of the source	<LD immediately	Decrease very slowly

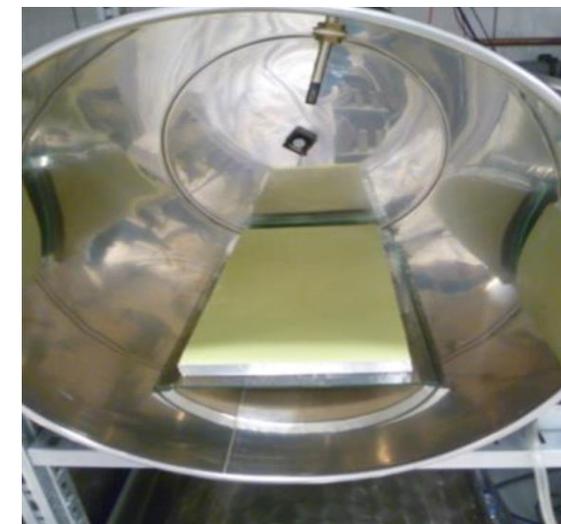
Evolution of formaldehyde concentrations after increasing the temperature to 40 ° C (1500 W radiator)



	Weeks 24-27	Weeks 28-29
PREGYROC AIR boards (µg/m ³)	6	14,7
STANDARD boards (µg/m ³)	13	34,9

Tests for the re-emission of formaldehyde in a test chamber (Wessling Laboratory)

Température ° C	Hygrométry %	J+1	J+3	J+14	J+28	J+45
22,5 ± 0,14	48,97 ± 5,82	< LD	< LD	-	-	-
38,79 ± 4,11	44,96 ± 7,58	6,3	6,2	5,5	5,6	< LD



After several months of contact with a source of highly concentrated formaldehyde the board retains it's A+ labeling at 22 ° and 38 °

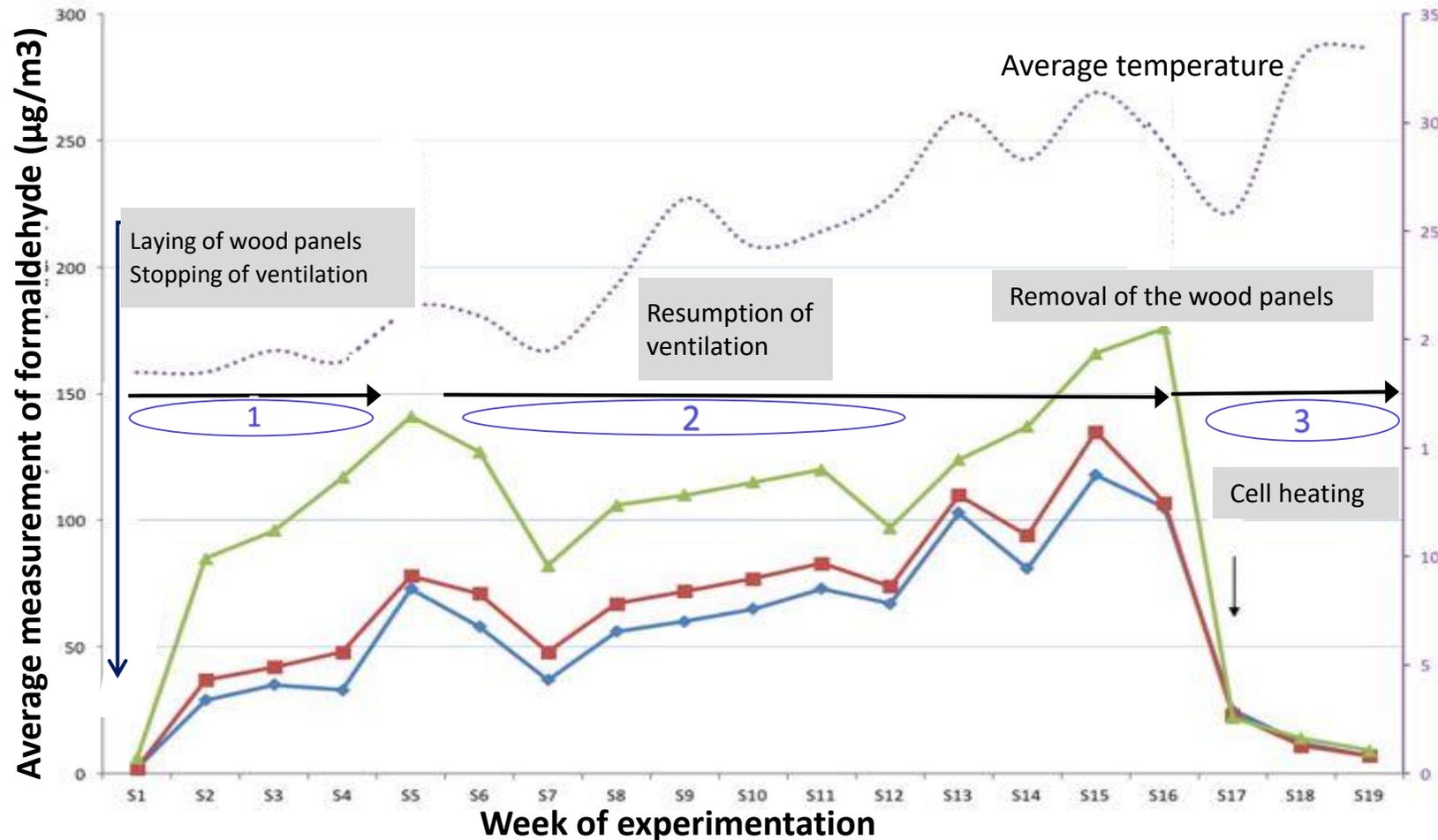


Launch of the 2nd study - 2016

France - Carpentras

	Goal	Cell 1	Cell 2	Cell 3 : control
Study 1	<ul style="list-style-type: none"> - Efficiency measurement of CAPT'AIR - Release 	<ul style="list-style-type: none"> -PREGYROC AIR® (18 mm) -CAPT'AIR® Technology -Unpainted boards 	<ul style="list-style-type: none"> -PREGYPLAC (18 mm) -Standard plasterboard -Unpainted boards 	<ul style="list-style-type: none"> -Aluminium coated boards -0% captation
Study 2	<ul style="list-style-type: none"> - Influence of paints on CAPT'AIR® technology efficiency - Release 	<ul style="list-style-type: none"> -PREGYROC AIR® (18 mm) -With « anti-voc » satin paint 	<ul style="list-style-type: none"> -PREGYROC AIR® (18 mm) -With matt paint 	<ul style="list-style-type: none"> -PREGYROC AIR® (18 mm) -Unpainted

Evolution of formaldehyde concentrations after introduction and removal of wood panels



- ◆— PREGYROC AIR® unpainted
- PREGYROC AIR® + matt paint
- ▲— PREGYROC AIR® + satin paint (anti-VOC)

Average concentrations µg/m ³			
Temperature		20°C	20 → 35°C
Week		2 - 7	8 - 16
Cells	1. Unpainted	44	81
	2. Matt standard paint	54	91
	3. Anti voc satin paint	108	128

To conclude

In the presence of a source of formaldehyde emission in test cells at real scale, the PREGYROC AIR[®] boards:

- decrease and stabilize the formaldehyde concentrations over several weeks, but at different levels depending on the temperature (influence on the emission rate)
- have very low re-emission at a temperature up to 40 ° C
- capture and neutralize formaldehyde with a low impact of a standard matt paint finish, unlike a satin paint

Thus, PREGYROC AIR[®] boards offer a complementary element in the reduction of formaldehyde exposure.

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