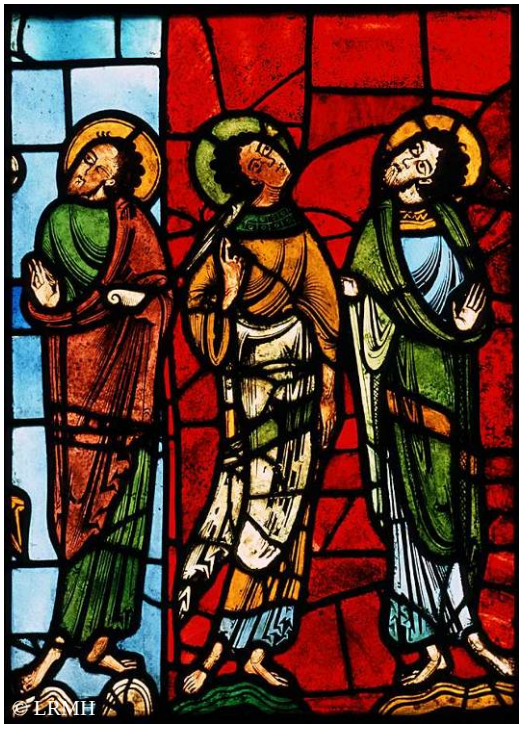
CONSTGLASS

Table of results

1- Pilot Object

Pilot object:	The *Crowning Virgin and the 12 apostles*, LE MANS **Bay XVI, panel 7**
Picture	 

Identification of the panel:

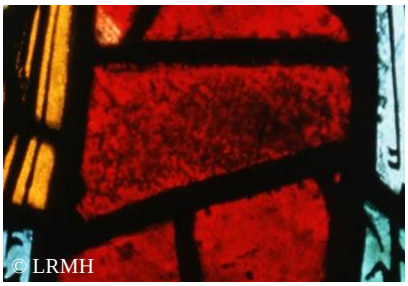
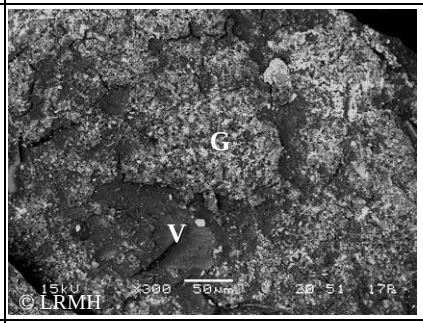
Bay: XVI
Panel: 7
Internal face, transmitted light
Internal face, reflected light

Treatment:

- **1974**, by Gruber studio.
- Product: polyurethane resin (80% Viacryl® VC363 + 20% Desmodur® N75).
- Application: with a soft brush after cleaning.

2-Results

Sample reference:	***CHA_bXVIp7_E_v4** : red glass, coated with Viacryl® on external surface*

Questions	**Techniques**	**Answers**
Morphology *- What is the morphology of the weathered coating?* *- How is the bonding between coating and glass?*  *Transmitted light, internal surface*  *Reflected light, external surface*	**Optical Microscope**	 On most of the pieces, Viacryl® has been washed away by rain and wind. Here, a large part is still in the craters: we can see the film has been retracted when hardened, it is yellowing and has a milky aspect. *Overview of flakes in craters.*
	SEM	 A flake of Viacryl® has been sampled. The gel layer (**G**) has been torn off with Viacryl® (**V**). There is not much corrosion products.
	Desktop tomography	*Not foreseen in this case*
	Phase-contrast tomography on Synchrotron	*Not foreseen in this case*
Chemical Composition *- What is the chemical composition of the alteration products ?*	**SEM/EDX**	The gel layer is a stratum of glass depleted in alkali and alkaline earth metal.
Organic component composition	**FTIR** **RAMAN**	*Not foreseen in this case, see panel 10*
Microbiology	**Molecular biology, ATP measurements**	*See sample "microbiology tests" at the end of this data sheet.*
Reversibility	**Test studies Elimination**	*Not foreseen in this case, see sample LEM_bXVIp6_v1*
Re-treatability	**Test studies Re-treatability**	No re-treatability was recommended. An external protective glazing was installed in 2008, by Debitus studio (Tours, 37).

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Sample reference:	***CHA_bXVIp7_I_v2** : red glass, consolidated with Viacry®l on internal surface*

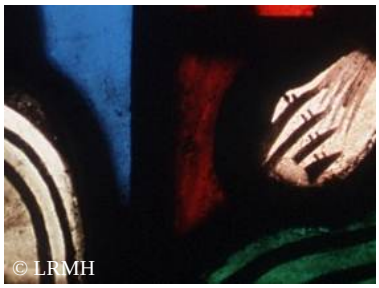
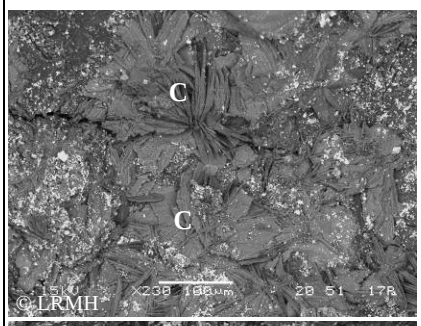
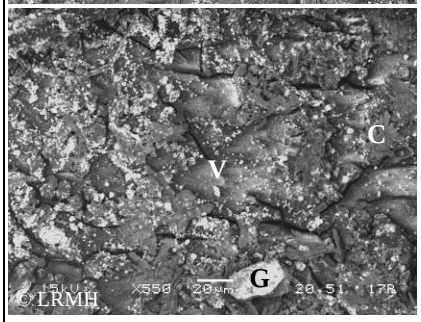
Questions	**Techniques**	**Answers**
Morphology *- What is the morphology of the weathered coating?* *- How is the bonding between coating and glass?*  *Transmitted light*  *Transmitted and reflected light*	**Optical Microscope**	*No optical microscope view* The whole surface of the piece is covered by corrosion products under Viacryl® film.
	SEM	 Corrosion products (**C**) with Viacryl® (**V**) have been sampled on the glass (**G**). *a - external surface of Viacryl® film.*  *b - internal surface of Viacryl® film : between film and glass.* The neo-crystallisations of gypsum are different depending on the condition of growth. On the film, their diameter is about 150µm, but under the consolidant, they are only 20µm and flattened.
	Desktop tomography	*Not foreseen in this case*
	Phase-contrast tomography on Synchrotron	*Not foreseen in this case*
Chemical Composition *- What is the chemical composition of the alteration products?*	**SEM/EDX**	The main component of corrosion products is gypsum. It comes from alteration of the glass or alteration of rests of putty.
Organic component composition	**FTIR** **RAMAN**	*Not foreseen in this case, see panel 10*
Microbiology	**Molecular biology, ATP measurements**	*See sample "microbiology tests" at the end of this data sheet.*
Reversibility	**Test studies Elimination**	The restoration has been made in 2005 by Pivet (Morthemer, 86) studio. N-methyl-2-pyrolidone has been used to remove corrosion products and Viacryl® on glass in internal surface.
Re-treatability	**Test studies Re-treatability**	No re-treatability was recommended. An external protective glazing was installed in 2008, by Debitus studio (Tours, 37).

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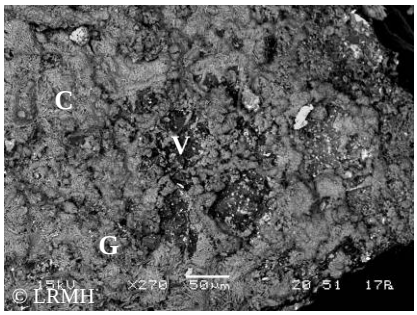
Table of results

Sample reference:	***CHA_bXVIp7_I_v3** : beige glass, consolidated with Viacryl® on internal surface*

Questions	**Techniques**	**Answers**
Morphology - *What is the morphology of the weathered coating?* - *How is the bonding between coating and glass?*  *Transmitted light*  *Transmitted and reflected light*	**Optical Microscope**	Most of the grisaille has a good shape on the glass. But on some areas, corrosion products are emerging on the glass and the paint. This phenomenon does not seem to take off the grisaille from its support. The corrosion products on the glass seem to peel: is it Viacryl® pushed away by alteration?  a - corrosion products on glass and paint, proliferating preferentially on edges of paints.  b - detail of the proliferation on glass and paint, and under Viacryl®.
	SEM	 Corrosion products with Viacryl® have been sampled on the glass. The neo-crystallisations of gypsum (**C**) are as little sticks (~10µm), between weathered glass (**G**) and Viacryl® (**V**). *Internal surface of Viacryl®-film: between film and glass.*
	Desktop tomography	*Not foreseen in this case*
	Phase-contrast tomography on Synchrotron	*Not foreseen in this case*
Chemical Composition - *What is the chemical composition of the alteration products?*	**SEM/EDX**	The main component of corrosion products is gypsum. It comes from alteration of the glass or alteration of rests of putty.
Organic component composition	**FTIR** **RAMAN**	*Not foreseen in this case, see panel 10*
Microbiology	**Molecular biology, ATP measurements**	*See sample "microbiology tests" at the end of this data sheet.*
Reversibility	**Test studies Elimination**	The restoration has been made in 2005 by Pivet (Morthemer, 86) studio. N-methyl-2-pyrolidone has been used to remove corrosion products and Viacryl® on glass in internal surface.
Re-treatability	**Test studies Re-treatability**	No re-treatability was recommended. An external protective glazing was installed in 2008, by Debitus studio (Tours, 37).

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Sample reference	*Microbiology tests*

Questions	Techniques	Answers
Microbiology *- Is there a biological contamination?* *- Is there an active infestation?*	**Molecular biology, ATP measurements**	No fungi, no Bacteria, no biological activity. Microbiological susceptibility has not been tested: no fresh product.

Conclusion: On the external face, it remains not much protective film. SEM investigations show that Viacryl® torn off a part of the gel layer.

On the internal face, the consolidation is still good on most of the paints. Where corrosion products are on the glass paint, they don't seem to have an impact, because in this case they seem to come from alteration of the putty. If they were coming from the glass, it would damage the paint. The excess of Viacryl® on glass is no more effective because of alteration growing.