CONSTGLASS

Table of results

1- Pilot Object

Pilot object:	The *Typological Passion*, CHARTRES **Bay 37, panel 44**
Picture	 

Identification of the panel:

Bay: 37
Panel: 44
Internal face, transmitted light
Internal face, reflected light

Treatment:

- **1988**, by Alliou studio.
- Product: polyurethane resin (80% Viacryl® SM564 + 20% Desmodur® N75).
- Application: with a soft brush after cleaning.

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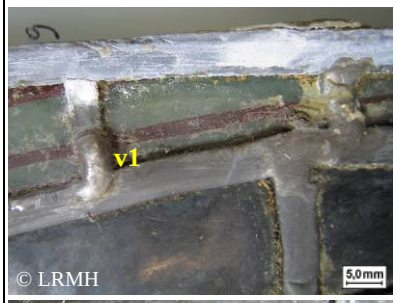
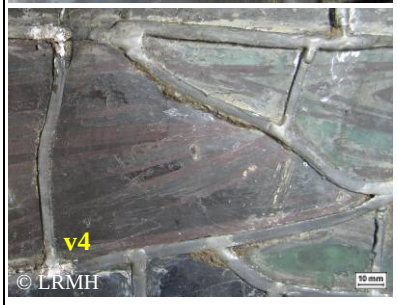
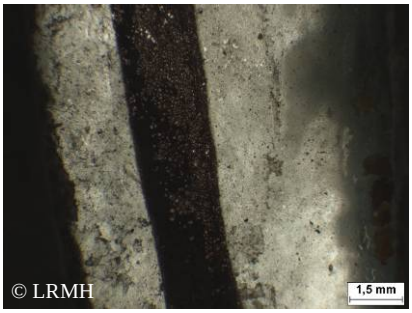
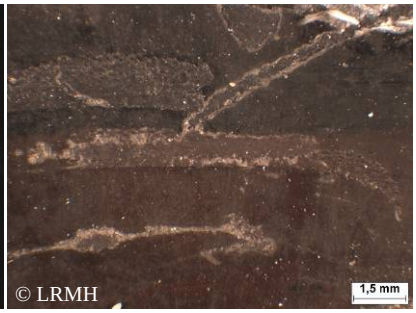
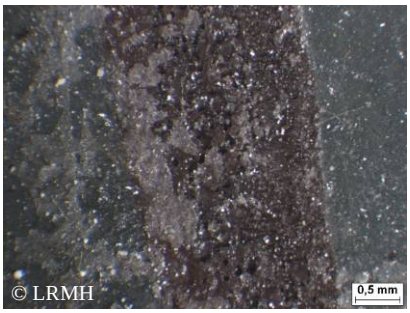
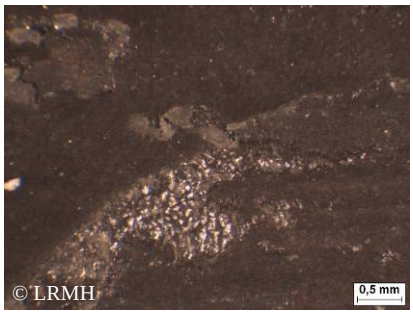
Table of results

2-Results

Sample reference:	***CHA_b37p44_I_v1 & v4** : glass paints coated on internal surface (consolidation)*

Questions	Techniques	Answers
Morphology - *What is the morphology of the coating under paint?* - *How is the bonding between coating and glass, and coating and paint?*  	**Optical Microscope**	No visible deterioration except scratches (provenance unknown) on some pieces (v4 for example), no macro-cracks, no yellowing or milky aspect. The glass paint on white glass (v1) was very porous because of a firing at a too high temperature.  *Sample v1, detail of the glass paint, transmitted light.*  *Sample v4, detail of the surface of the piece with scratches on Viacryl® coating, the glass paint is bore, reflected light.*  *Sample v1, detail of the surface of the piece with rests of Viacryl®: no more adherence with the support.*  *Sample v4, detail of glass paint with Viacryl®: milky aspect when loss of adherence, lumpy and brilliant aspect.*
	SEM	*Not foreseen in this case*
	Desktop tomography	
	Phase-contrast tomography on Synchrotron	
Chemical Composition	**SEM/EDX**	
Organic component composition	**FTIR**	
	RAMAN	
Microbiology	**Molecular biology, ATP measurements**	*Not foreseen in this case, see sample "microbiology tests" at the end of this data sheet.*

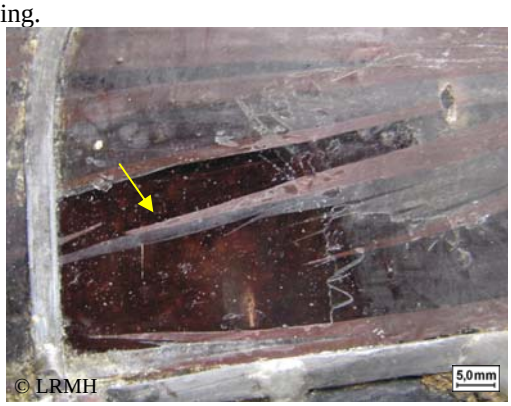
Reversibility - *Removal without damage?* - *Method, solvent?*	**Test studies** **Elimination**	Here, only ethanol gel (with Klucel G) was used to remove the polymer on a part of sample v4: 3 applications of 1 hour, rinsing with a cotton swab and ethanol, scouring.  The arrow show the cleaned area: ethanol gel is effective, less dangerous than N-methyl-2-pyrrolidone for the grisaille and the human.
Re-treatability - *Necessity? Which product?* - *Compatibility? Durability?*	**Test studies** **Re-treatability**	No need to re-treat grisaille on this case. *See tests performed on bay 37, panel 16.*

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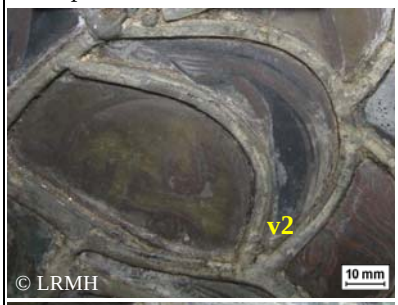
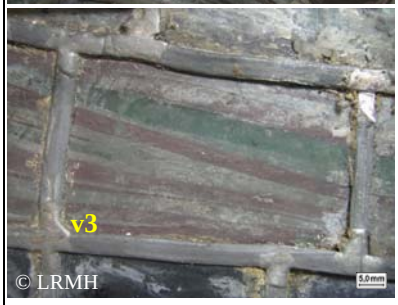
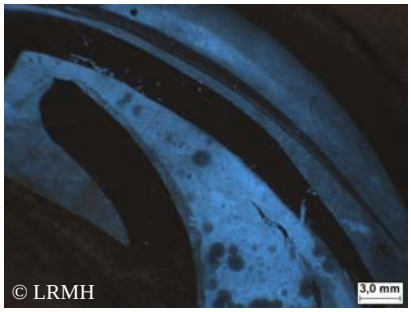
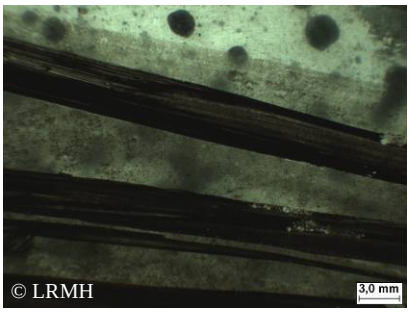
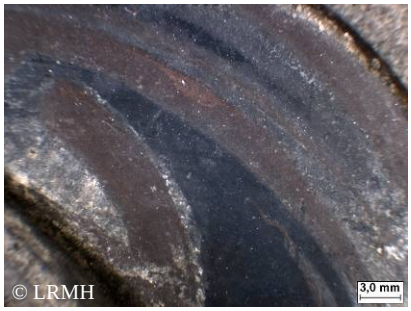
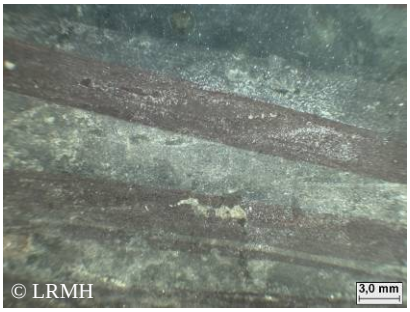
Table of results

Sample reference:	***CHA_b37p44_I_v2 & v3*** *: glass paints consolidate with Viacryl®*

Questions	Techniques	Answers
Morphology - *What is the morphology of the coating under paint?* - *How is the bonding between coating and glass, and coating and paint?*  	**Optical Microscope**	Difficult to see Viacryl®: only excess on the edges of paint are visible with microscope. They have a lumpy and sometimes a brilliant aspect, but no macro-cracks, no yellowing or milky aspect.  *Sample v2, detail of paint and wash drawing, transmitted light.*  *Sample v3, detail of paint and wash drawing, transmitted light.*  *Sample v2, same view, reflected light.* White corrosion products seems to be located on the wash drawing.  *Sample v3, same view, reflected light.* Same phenomenon as sample v2, but also on thin paint. The white corrosion products seem to be between glass and paint. They emerge only on thin layers and wash drawing. A higher magnification is needed to see their impact on Viacryl®.

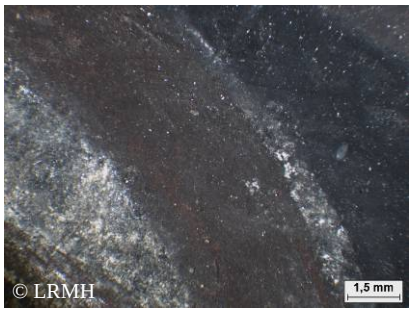
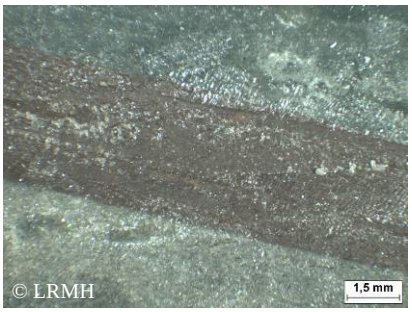
		 *Sample v2, detail of the interface paint/ wash drawing :Viacryl® is on the surface of corrosion products.*  *Sample v3, detail of the interface paint/ wash drawing: Viacryl® is in excess on the whole surface.* Viacryl® is on the surface and seems not to have changed. It's possible that corrosion products are prior to the application of the polymer.
	SEM	*Not foreseen in this case*
	Desktop tomography	
	Phase-contrast tomography on Synchrotron	
Chemical Composition	**SEM/EDX**	
Organic component composition	**FTIR**	
	RAMAN	
Microbiology	**Molecular biology ATP measurements**	*Not foreseen in this case, see sample "microbiology tests" at the end of this data sheet.*
Reversibility	**Test studies Elimination**	*Not foreseen in this case, see sample v4*
Re-treatability	**Test studies Re-treatability**	

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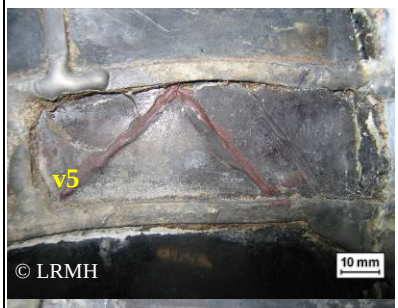
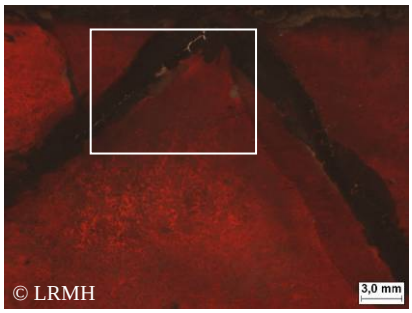
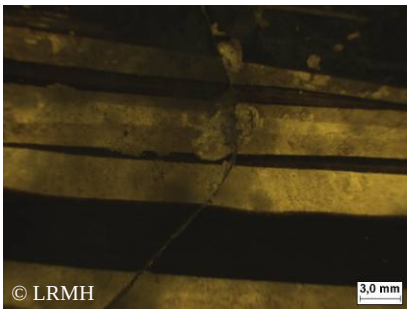
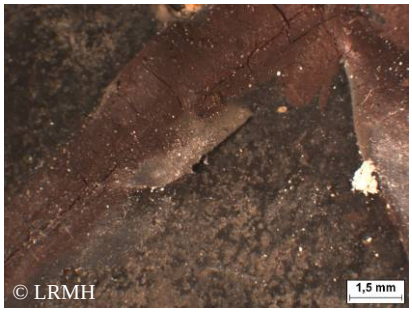
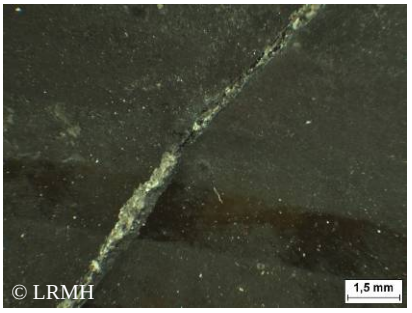
Table of results

Sample reference:	*CHA_b37p44_I_v5 & v6 : broken glasses with silicone edge bonding*

Questions	Techniques	Answers
Morphology *- What is the morphology of the coating under paint?* *- How is the bonding between coating and glass, and coating and paint?*  	**Optical Microscope**	 *Sample v5, detail of the silicon bonding with cold paint on , transmitted light. White rectangle locates the view below.*  *Sample v6, detail of the silicon bonding without excess or cold paint, transmitted light.*  *Sample v5, detail, reflected light. Loss of adherence is not serious. Cold paint is cracked because of silicon flexibility.*  *Sample v6, detail, reflected light. White corrosion products are between edges of glass, where there is no more silicon.* The adherence of the polymer with edges of the glass seems to be good, as well as mechanical behaviour. But an unstopping is harmful for most of the bondings.
	SEM	*Not foreseen in this case*
	Desktop tomography	
	Phase-contrast tomography on Synchrotron	
Chemical Composition	**SEM/EDX**	
Organic component composition	**FTIR**	
	RAMAN	
Microbiology	**Molecular biology, ATP measurements**	*Not foreseen in this case, see sample "microbiology tests" at the end of this data sheet.*
Reversibility *- Removal without damage?* *- Method, solvent?*	**Test studies Elimination**	Mechanical reversibility is easy: tearing off the joint and scouring with a rubber.

Re-treatability *- Necessity? Which product?* *- Compatibility? Durability?*	**Test studies Re-treatability**	Two products were tested: a new transparent silicone without acetic acid (Silirub N05 neutral, Soudal) and an epoxy rubber (Araldite® 2020, ciba). Both of them were satisfactory during application and have a good mechanical behaviour when dried.	

Sample reference	***Microbiology tests***

Questions	**Techniques**	**Answers**
Microbiology *- Is there a biological contamination?* *- Is there an active infestation?* 	**Molecular biology ATP measurements** (Microscopical analysis, metabolic activity and taxonomical description of microorganism)	Treatment with VIACRYL (coarse application, in storage, 2 samples): - slight accumulation of dust and dirt, no visible fungal infestation - low metabolic activity (ATP 261 RLU/25 cm²) - isolated microorganisms: *Chaetonium globosum*, (fungus; low contamination) and one bacterium (not identified; low infestation) Done on 2samples One sample nothing and one other is full of Chaetonium globosum (attracted by cellulose, may be due to the cleaning during last restoration)! So prudence for interpretation! No idea of impact on the glass. No more samples, because of the fragility of the grisaille.

Conclusion: Regarding Viacryl®, the consolidation was systematic and most of the pieces are coated on internal surface (rather than a punctual consolidation). The polymer is well preserved and still effective. The only weak glass paints are those found under some scratches: the weathered and the healthy paint are bore. On some pieces, where the polymer has been applied only on the grisaille, corrosion products are resuming on the glass and the thin paints, but they don't seem to be deteriorated at the moment.

The re-treatability of Viacryl® is hard because of the glass paint under it and the good state of preservation of the film. Nevertheless, ethanol gel (or poultice) is the best products to remove the polymer.

Regarding Silicone rubber, the bonding is still effective until the unstopping of the piece. Removing the polymer is easy, and the re-treatments with neutral silicone or epoxy rubbers are satisfactory.