CONSTGLASS

Table of results

1-Pilot object

Pilot object:	**Cologne Cathedral** s XXII, south side aisle, "Adoration of the Magi" (1846)

Picture


internal face


internal face


external face

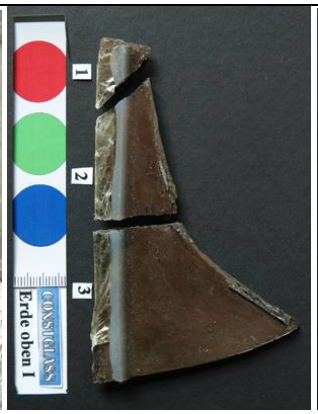
Identification of the panel:
s XXII (south side aisle)
internal face

Treatment and other materials:
- the last conservation campaign of 1981/82 was carried out by an outside company.

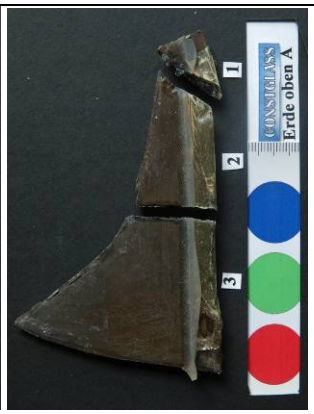
Product:
- BS 31 is a methyl silicone resin (50% Toluene + 2% hardener TU 2) (producer: Wacker Chemie, München, Germany);
- SH 1 is a thermoplastic black coloured two component epoxy resin (producer: Glasbau Hahn, Frankfurt).

Application: The resin was applied with a brush after bonding of cracks and retouching. The application was carried out either partial or all over the surface. During the application ethyl acetate was used to prolong the setting time.
- the samples are completely coated on the internal face; the external face was only coated along and over the cracks.
- the sample has been divided in 3 separate pieces after the cracks had been opened.
- the cracks were bonded with SH 1.
- the panel was framed with U-profiles of brass, sealed with an industrial silicone for sealants.
- on the linear edge of the sample still sticks an old adhesive tape.


sampling area



internal face
sample - Col_BS31_1
sample - Col_BS31_2
sample - Col_BS31_3



external face
sample - Col_BS31_1
sample - Col_BS31_2
sample - Col_BS31_3

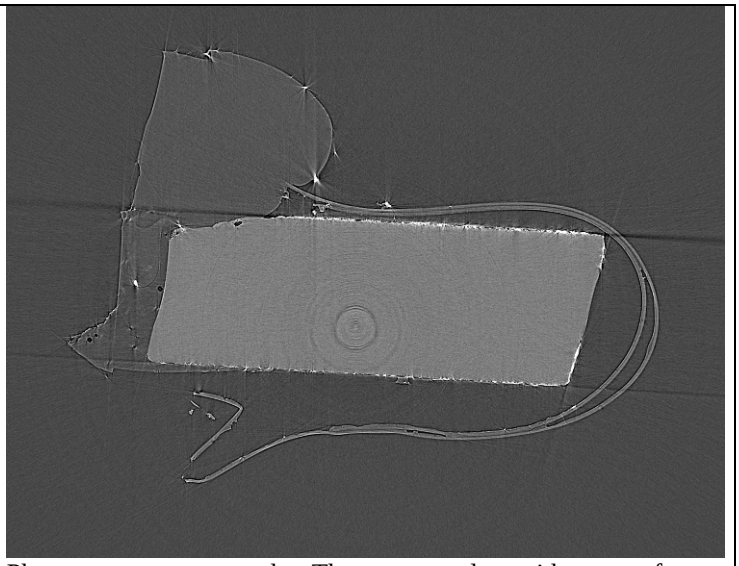
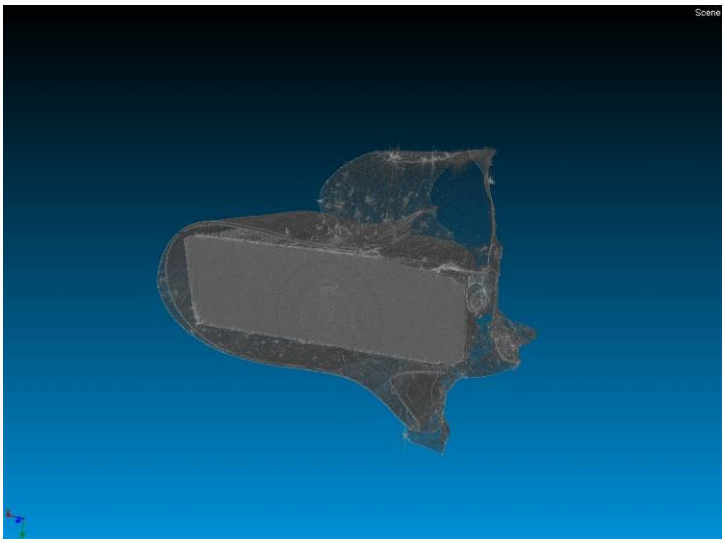
Remarks		All in all, the applied BS 31 seems to be in a rather sufficient condition. Only in some areas where the material had been thicker applied, the BS 31 has a milky aspect, looks crizzled and starts to delaminate. Obviously this delamination does not damage the original glass surface and the original paint, only the retouches – made immediately before the coating with BS 31 – supposedly will come off with the BS 31. Nevertheless, from the conservator's point of view there is no necessity to remove the BS 31 at the moment.

2-Results (first sample)

sample reference:	**Col_BS31_1 (Elettra)** light coloured glass with BS 31 on the internal face

Questions	Techniques	Answers
Morphology - *What about the today's condition of BS 31?* - *What about the adhesion between glass and BS 31?* - *Did the BS 31 penetrated the paint-layer, is there a reaction between BS 31 and the paint layer?* - *What about the condition of the other materials?*  Col_BS31_1 (internal face)	**Optical Microscope** (DBV)	The internal face coated with BS 31 appears in a sufficiently good condition. Only some parts of the coating (thickly applied) have a milky aspect as if air bubbles were enclosed. Under the microscope crizzled areas are visible. The crack bonding is stable. To separate the sample, cracks had to be opened. The silicone has a good adhesion to the surface (in- and external face). The old cello-tape was used to fix the instable glass-edges during the last restoration. The tape is now brittle and lost adhesion.

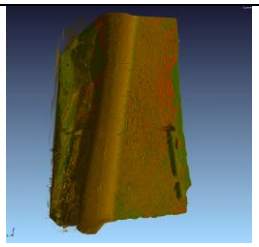
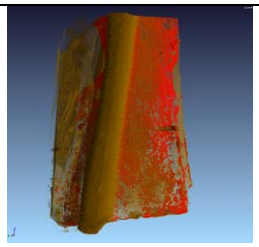
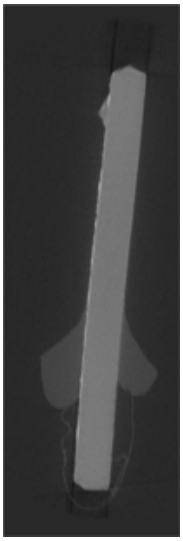
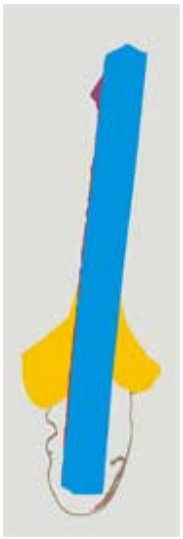
Typical phenomenon of the BS 31 treatment, exemplified by another area of the treated panel  internal face		 internal face  external face	Where BS 31 delaminates, the areas have a milky aspect. This occurs mainly in the thicker applied parts of the coating and close to the cracks. In some areas the BS 31 coating has cracks.
	SEM (Institute)	n/a	
	Desktop tomography (Institute)	n/a (only Col_BS31_2)	

	Phase-contrast tomography on Synchrotron (Elettra)	 Phase-contrast tomography: The compact glass with traces of metal, the silicone and the tape is very good visible.  3D-rendering of the same sample as above.
Chemical Composition *Is there any alteration of BS 31?*	**SEM/EDX** (Institute)	for organic materials this analytic device is not suitable.
Organic component composition	**FTIR** (Institute)	for questions regarding the alteration of the product no reference spectrum of unaltered material for comparison issues is available, the product is not available any more.
	RAMAN (Institute)	for questions regarding the alteration of the product no reference spectrum of unaltered material for comparison issues is available, the product is not available any more.

Microbiology	**Molecular biology ATP measurements** (Institute)	not foreseen
Reversibility *-How can the film be removed without damage for glass and paint-layer?* *-Which method and what solvent can be used?*  external face	**Test studies elimination** (DBV) The reversibility test was carried out <u>not</u> on the separated and scientifically investigated sample but on another comparable segment in the coated panel.	Tests with various solvents and solvent mixtures were carried out. Best result: By applying a compress with ethanol (gel with 5% Klucel® M), for 2x2 minutes and a subsequent cleaning with cotton swabs the BS 31 coating could visibly be removed.
Re-treatability	**Test studies re-treatability**	not intended

2-Results (second sample)

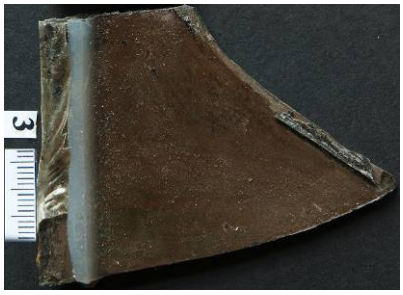
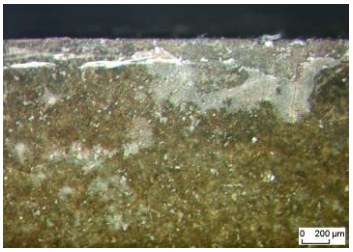
sample reference:	**Col_BS31_2 (UGhent)** light coloured glass with BS 31 on the internal face

Questions	Techniques	Answers
Morphology - *What about the today's condition of BS 31?* - *What about the adhesion between glass and BS 31?* - *Did the BS 31 penetrated the paint-layer, is there a reaction between BS 31 and the paint layer?* - *What about the condition of the other materials?*	**Optical Microscope** (DBV)	The internal face coated with BS 31 appears in a sufficiently good condition. Only some parts of the coating (thickly applied) have a milky aspect as if air bubbles were enclosed. Under the microscope crizzled areas are visible. The crack bonding is stable. To separate the sample, cracks had to be opened. The silicone has a good adhesion to the surface (in- and external face). The old cello-tape was used to fix the instable glass-edges during the last restoration. The tape is now brittle and lost adhesion.
 Col_BS31_2 (internal face)	**SEM** (Institute)	not foreseen
	Desktop tomography (UGhent)	  3D rendered volume of the glass fragment. The silicone is rendered orange, the glass green and the paint layer red.    blue: glass yellow: silicone (sealant) red line: paint layer brown: cello tape

	Phase-contrast tomography on Synchrotron (Institute)	n/a (only Col_BS31_1)
Chemical Composition *Is there any alteration of BS 31?*	**SEM/EDX** (Institute)	for organic materials this analytic device is not suitable.
Organic component composition	**FTIR** (Institute)	for questions regarding the alteration of the product no reference spectrum of unaltered material for comparison issues is available, the product is not available any more.
	RAMAN (Institute)	for questions regarding the alteration of the product no reference spectrum of unaltered material for comparison issues is available, the product is not available any more.
Microbiology	**Molecular biology ATP measurements** (Institute)	not foreseen
Reversibility	**Test studies elimination**	see above: Col_BS31_1 (first sample)
Re-treatability	**Test studies re-treatability**	not intended

2-Results (third sample)

sample reference:	**Col_BS31_3 (ISC)** light coloured glass with BS 31 on the internal face

Questions	Techniques	Answers	
Morphology - *What about the today's condition of BS 31?* - *What about the adhesion between glass and BS 31?* - *Is there penetration and reaction between BS 31 and the paint layer?* - *What about the condition of the other materials?*  Col_BS31_3 (internal face)	**Optical Microscope** (DBV, ISC)	 Air bubbles within the coating, milky spots seem to be due to light refraction and indicate the first steps for later delamination, there are no cracks in the coating detectable, most of the sample is not affected by any delamination.  Flaking off and delamination of the coating only at the border of the sample detected, paint layer is not affected.	The internal face coated with BS 31 appears in a sufficiently good condition. Only some parts of the coating (thickly applied) have a milky aspect as if air bubbles were enclosed. Under the microscope crizzled areas are visible. The crack bonding is stable. To separate the sample, cracks had to be opened. The silicone has a good adhesion to the surface (in- and external face). The old cello-tape was used to fix the instable glass-edges during the last restoration. The tape is now brittle and lost adhesion.
	SEM (Institute)	not foreseen	
	Desktop tomography (Institute)	not foreseen	
	Phase-contrast tomography on Synchrotron (Institute)	not foreseen	
Chemical Composition *Is there any alteration of BS 31?*	**SEM/EDX** (Institute)	for organic materials this analytic device is not suitable.	

Organic component composition	**FTIR** (Institute)	for questions regarding the alteration of the product no reference spectrum of unaltered material for comparison issues is available, the product is not available any more.
	RAMAN (Institute)	for questions regarding the alteration of the product no reference spectrum of unaltered material for comparison issues is available, the product is not available any more.
Microbiology	**Molecular biology ATP measurements** (Institute)	not intended
Reversibility	**Test studies elimination**	see above: Col_BS31_1 (first sample)
Re-treatability	**Test studies re-treatability**	not intended