Historical recipes for preparatory layers for oil paintings in manuals, manuscripts and handbooks in North West Europe, 1550-1900: analysis and reconstructions

Stols-Witlox, M.J.N.

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Appendix 22 Tables belonging to Chapter 15

Table 15.1 Analyses of pigments and binding media of streaky imprimaturas in Rubens's paintings

medium (method of analysis)	*pigment (method of analysis)*	*painting, collection*	*thickness of imprimatura*	*publication date/ analysis*
Oily (GC-MS) Coremans 1962: 119	Lead white, charcoal black, chalk (not specified) [Kockaert 1992b: 177]	*Descent from the cross*, Cathedral, Antwerp	10 – 40 µ	1962/1992
Drying oil (tentatively concluded) Feller 1973: 56		*The Gerbier family*, National Gallery, Washington	15 – 45 µ	1973
Linseed oil and pine resin (GC-MS and FTIR) National Gallery London files 2002		*An autumn landscape with a view of Het Steen*, National Gallery, London		1982
Drying oil (staining with Sudan Black) Plesters 1983: 36	Lead white, raw umber (optical microscopy)	*Samson and Delilah*, National Gallery, London	10 – 15 µ	1983
Oil with indications of protein addition: emulsion (microchemical tests) Kockaert 1992a: 64, 67	Lead white, charcoal black, chalk (optical microscopy, microchemical tests, electron microprobe) [Kockaert 1992: 64]	*Elevation of the cross*, Cathedral, Antwerp	10-60 µ	1992
	Lead white, organic black (not specified) Van Hout 2005: 163	*The three graces*, Prado Museum, Madrid		1993
	Lead white, chalk, charcoal black, yellow-brown earth (not specified) Kamba 2004: 77	*The flight of Lot and his family from Sodom*, John and Mable Ringling Museum of Art, Sarasota, FL	30-80 µm	1994
Egg, possibly with the addition of oil (DTMS/FTIR) Lammertse and Vergara 2003: 69, Boersma et al. 2007	Charcoal black, chalk, occasional lead white particles, red ochre (optical microscopy, SEM-EDX)	*Thetis dipping Achilles in the Styx* and *The education of Achilles*, Achilles Series, Museum Boijmans-Van Beuningen, Rotterdam		2003/2007
Drying oil (SIMS/FTIR)	Lead white, chalk, charcoal black,	*'Modello' for the Assumption of the*	20-22 µm	2005

medium (method of analysis)	***pigment (method of analysis)***	***painting, collection***	***thickness of imprimatura***	***publication date/ analysis***
Ferreira and Boon, FOM-AMOLF, unpublished report for the Mauritshuis 2005	some minium (optical microscopy, SEM-EDX/SIMS/FTIR)	*Virgin*, Royal Picture Gallery Mauritshuis, The Hague		
	Lead white, charcoal black, possibly chalk (optical microscopy) Unpublished report, Mauritshuis 2005. B Schoonhoven	*The triumph of Rome: The youthful emperor Constantine honouring Rome*, Royal Picture Gallery Mauritshuis, The Hague		2005
	Lead white, earth pigments, black (optical microscopy) Verhave, Statens Museum, *pers comm.* 26 February 2007	*The Ascent to Calvary. The Bearing of the Cross* (*c*.1634), Statens Museum for Kunst, Copenhagen.	20 µm	Unpublished research, 2007
Heat-bodied linseed oil and pine resin (not specified) National Gallery, London, files, 2002	Lead white, carbon black, red earth (not specified) Courtauld Institute of Art, London, conservation file	*Family of Jan Brueghel the Elder*, Courtauld Art Gallery, London.		Unpublished research, no date.

Table 15.2. Pigment composition for second ground layers on panel in historical recipes

date	*author*	*pigments*	*binder*	*application details*
1550	Vasari 1550 (1568): 52 (transl. Maclehose and Brown 1960:230)	lead white, umber, earths	linseed or nut oil	plastered over, beaten with hand
1620-44	De Mayerne 1620-44: 11	lead white, umber	unspecified	'a light layer'
	De Mayerne 1620-44: 90v	ceruse [lead white], umber	oil	[1 layer]
1634	Peacham 1634: 130	Red lead or some other colour	unspecified	'prime with'
1640	Norgate 1640 (transcr. Hardie 1919: 91)	lead white	oil	[1 layer]
1653-57	King 1653-57: 52	ceruse, charcoal black, red lead	unspecified	[1 layer]
1664	*Art of painting in oyle* 1664: 97	unspecified	unspecified	'priming layer'
1672	Salmon 1672: 141	lead white	oil	[1 layer]
1676	Félibien 1676: 407	chalk, red earth	oil	'oil priming'

Table 15.3. Preparation details of reconstructed imprimaturas

Unless stated otherwise, imprimaturas are pigmented with stack-process lead white, raw umber and charcoal black. For reasons of safety, lead white was always ground with the medium before other pigments were added. Other pigments were mixed with the paint using a palette knife or ground into the paint on a granite slab.

binder type	*binder preparation details*	*ground on slab*	*mixed with palette knife*	*paint preparation details and comments*	*pre-wetting of brush*	*application details*	*c*
Imprimaturas without chalk							
Whole egg	Egg whisked until liquid.	X		Distilled water was used to dilute the paint. Easy preparation	dist. water	Spreads well but medium stiffens quickly.	M M w w
Egg yolk	Yolk whisked until liquid.	X		Easy preparation	dist. water	Spreads well but medium stiffens quickly. Only repeated brushing removes most of the air bubbles.	S a A i l
Egg white	Egg white shaken and left to settle. Liquid used.	X		Easy preparation.	dist. water	Spreads well but medium stiffens quickly.	S b b i
Sheep parchment glue	Glue boiled from sheep parchment and distilled water (5% w/w).	X		Difficult grinding because paint dries. Water added in one reconstruction.	dist. water	Easier to apply over oil isolation layer than non-isolated area. *Imprimatura* over glue isolation layer cannot be reworked because it swells glue isolation layer.	M b
Calf parchment glue	Glue boiled from calf parchment and distilled water (5% w/w).	X		Difficult grinding because paint dries. Water added in one reconstruction.	dist. water	Easier to apply over oil isolation layer than non-isolated area. *Imprimatura* over glue isolation layer cannot be reworked because it swells glue isolation layer.	M
Goat's skin glue	Glue boiled from alum tawed goat's skin and distilled water (7% w/w).	X		Difficult grinding because paint dries.	dist. water	Easier to apply over oil isolation layer than non-isolated area. *Imprimatura* over glue isolation layer cannot be reworked because it swells glue isolation layer.	M
Gum Arabic	Gum dissolved in boiling dist. water (1:2). Filtered	X		Difficult grinding because paint dries. Water	dist. water	If paint too thin it forms air bubbles and pools on section with	V i

binder type	*binder preparation details*	*ground on slab*	*mixed with palette knife*	*paint preparation details and comments*	*pre-wetting of brush*	*application details*
	through cheesecloth.			added in one reconstruction.		oil isolation layer
Gum Tragacanth	Gum swollen overnight in distilled water, heated and stirred (0.2 % w/w).	X		Difficult to grind. Becomes sticky during grinding.	medium	Spreads well. Some air bubbles.
Raw linseed oil	Raw oil pressed from organically grown *Electra* linseeds.	X		Easy preparation. Pigmented with vine black instead of charcoal black.	medium	Very hard to spread. Requires repeated brushing, which results in loss of streaks
Litharge treated linseed oil	Litharge and raw oil (1:2) heated to 150 ^{o}C and cooled to ambient temperature.		X	Paint mixed with palette knife to investigate formation of lead white conglomerates. Vine black instead of charcoal black.	medium	Very hard to spread. Requires repeated brushing, which results in loss of streaks
Fat oil/ egg emulsion	Whole egg and litharge treated oil (1:2) shaken together to emulsify. Diluted with drops of distilled water.	X		Easy grinding because oil prevents paint from drying.	medium	Needs repeated brushing for spreading, but does not lose streaks so much
Lean oil/egg emulsion	Pigments ground with whole egg. Raw linseed oil added drop wise until paint thickens.	X		Easy grinding, though medium tends to dry a little during grinding.	egg	Easy to spread thinly, very silky and pleasant.
Fat oil/glue emulsion	Sheep parchment glue (5% w/w) added to litharge-treated oil/lead white paint, mixed and ground on slab.	X	X	Easy grinding because oil prevents paint from drying.	medium, dist. water	Can only be brushed out slowly because the paint is very sticky
Lean oil/glue emulsion	Pigs skin glue ground with pigments, raw linseed oil added drop wise until paint thickens.	X		Easy grinding, though medium tends to dry a little during grinding.	glue	Easy to spread thinly, smooth feel because of oil component.

binder type	*binder preparation details*	*ground on slab*	*mixed with palette knife*	*paint preparation details and comments*	*pre-wetting of brush*	*application details*	*c*
Fat oil/gum Arabic emulsion	Gum dissolved in dist. water (1:2), lead white ground with gum. Litharge treated linseed oil added drop wise. (1 pt gum: 2 pts oil)	X		Oil mixed with gum Arabic paint very easily. Paint very gritty. Water added and reground. Complicated preparation.	dist. water	More water added for application. Easy to apply.	S d g
Linseed oil/ turpentine oil	Litharge treated linseed oil with addition of Kremer turpentine oil (2:1).		X	Easy preparation.	turpentine oil	Easy to apply.	S
Linseed oil/ spike oil	Raw linseed oil with an addition of spike oil (7:2) .		X	Easy preparation.	spike oil	Easy to spread.	S
mastic/ linseed oil /turpentine varnish	Mastic varnish (mastic heated with gum turpentine 1:2) and litharge treated linseed oil heated (2:1). Ground with lead white, turpentine oil added.	X		Difficult to prepare. Sticky binding medium causes difficulties during pigment grinding.	medium	Difficult to apply due to stickiness. Not possible to go over same area twice without lifting layer applied before.	V C a t
Copal oil varnish	1 pt. Powdered Kauri copal heated to 355 ^{o}C, cooled to 260 ^{o}C, 2 parts pre-heated linseed oil added, boiled together for 1 hour to max 300 ^{o}C. Cooled to 204 ^{o}C, 3 parts turpentine oil added Medium prepared in 1993 (Carlyle 2001: 49)	X		Sticky binding medium causes difficulties during pigment grinding.	medium	Difficult to apply due to sticky paint.	V C a t
Colophony/oil / turpentine varnish	Colophony powder heated in turpentine oil to 95 ^{o}C (1:2) until resin has dissolved. Poured off, mixed with litharge treated linseed oil (2:1).	X		Sticky binding medium causes difficulties during pigment grinding.	medium	Paint runs off palette knife but sticks to brush. Difficult to apply. Very sticky and gives crumbly result.	V C a t

binder type	*binder preparation details*	*ground on slab*	*mixed with palette knife*	*paint preparation details and comments*	*pre-wetting of brush*	*application details*
Imprimaturas with chalk added to general pigment mixture						
Drying oil/ turpentine oil	Litharge treated linseed oil mixed with pigments, turpentine oil added dropwise.	X		Turpentine oil mixed in with palette knife on slab.	turpentine oil	When enough turpentine oil is added, the paint is easy to spread and apply. Much thinning results in vague streaks.
Fat oil/ egg emulsion	Litharge treated linseed oil and whole egg (1:2) shaken to emulsify, thinned with few drops of turpentine oil.	X		Turpentine oil mixed in with palette knife on slab.	medium	When enough turpentine oil is added, the paint is very easy to spread and apply
Imprimaturas with chalk, without lead white						
Drying oil/ turpentine oil	Lead treated linseed oil. Turpentine oil added drop wise with palette knife on slab.		X	Chalk mixed into oil with palette knife before adding other pigments.	Turpentine oil	Paint easy to spread, good streaks. Needs some extra brushing.