

# B12 Chemische analyse glas

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## Scientific analysis of the Leiderdorp Plantage vessel glass

### B12.1 The samples

Two samples of glass were taken from the same glass vessel fragment (V1913), part of a convex body of translucent funnel beaker with combed opaque white trails.

### B12.2 The technique

The glass samples were chemically analysed using an energy-dispersive X-ray fluorescence spectrometer (ED-XRF) attached to an SEM. The analysis was carried out in the Nano centre in the School of Chemistry in Nottingham University using a Philips XL30 SEM fitted with a tungsten (W) electron gun and operated at a beam (accelerating) voltage of 20kV, and 15nA. Quantitative analyses were determined using an INCA EDX microanalysis system. A Secondary standard (Corning B) was analysed in order to define accuracy and precision.

### B12.3 The results

Quantitative results are given in Table 1 below

element oxide	Al <sub>2</sub> O <sub>3</sub>	CaO	Cl	CoO	CuO	FeO	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	PbO	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	total
LEID1_o1	2.28	16.38	ND	ND	ND	ND	10.16	7.2	0.91	0.88	ND	ND	62.19	ND	100
LEID1_o2	2.15	21.05	ND	ND	ND	ND	15.17	7.83	1.32	1.12	ND	ND	51.36	ND	100
LEID1_o3	2.28	16.56	ND	ND	ND	ND	10.28	7.3	0.96	0.85	ND	ND	61.77	ND	100
LEID2_o1	2.75	9.45	0.71	ND	ND	1.43	0.69	ND	0.41	17.59	ND	ND	66.97	ND	100
LEID2_o2	2.78	9.42	0.8	ND	ND	1.15	0.68	ND	0.44	17.32	ND	ND	67.4	ND	100
LEID2_o3	2.81	9.15	0.76	ND	ND	1.03	0.69	ND	0.26	18.37	ND	ND	66.92	ND	100

Table B12.1 Quantitative chemical analyses of the 2 glass samples (ND = not detected).

### B12.4 Discussion

The blue body of the vessel is of a soda-lime-silica natron glass composition and probably coloured with a combination of manganese and iron oxides: the blue colour being mainly due to ferrous iron

(Fe<sup>2+</sup>). The detection limit for cobalt oxide using this system is 0.08 % so it is still possible that cobalt is present, contributes to the coloration but has not been detected. It is likely that this glass was made in the Levant and imported, perhaps as raw glass or cullet and blown into the vessel. The white glass is of a chemical composition that is diagnostic of Carolingian glass that was made in western Europe. It contains a very high magnesium oxide level of c. 7.5 %, a high potassium level of c. 13% and a high calcium oxide level of c. 18 %. These levels are considerably higher than found in natron glasses and indicate that wood ash was used as a flux to make the glass rather than natron.

This high potassium glass has a direct parallel in glasses from Dorestad analysed using electron probe microanalysis (Sablerolles/Henderson 2012). This Carolingian glass was being produced soon after the first wood ashes were used to make glass in northwest Europe; from about the 11th century wood was set to become the dominant flux to make glass. Therefore it is likely that the vessel was made using glass from 2 different sources: the Levant and northwestern Europe.

#### **B12.5 Reference**

Sablerolles, Y./J. Henderson, 2012: De glasvondsten, in J. Dijkstra (ed.), *Het domein van de boer en de ambachtsman. Een opgraving op het terrein van de voormalige fruitveiling te Wijk bij Duurstede: een deel van Dorestad en de villa Wijk archeologisch onderzocht*, Amersfoort (ADC Monografie 12), 339-340, afb. 6.25, tabel 6.2.