Data Ion Chromatography Analysis

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Object / Record :	**V259 (KN&V)**	
Artist :	Ettore Sottsass	
Title and date :	Toso Vetri d'Arte - 1982 schaal	
Conservator :	Mandy Slager	

General condition

Date: 16/09/2020

2011: *conditie slecht, gereinigd met gedemineraliseerd water en ethanol (2:1), n* o VAB images taken
2013: *conditie slecht, glasziekte, druppels onderzijde standvlak, weeping*
2017: June 23: samples taken en IC analysis by G. Verhaar
2017: Sept 17 samples taken and IC analysis G. Verhaar, M. Slager and UvA, w*it en blauw glas vettig, rode en transparante niet, mat rood beetje en kleurloos, cloudiness met stippelig patroon binnenkant kleurloze glas, oppervlak in geheel vlekkerig en vies.*
2023: Interior surface white bowl, white ornament on bowl, blue triangular points on bowl, white band exterior bowl, red part, white foot: not slippery transparant part stem green and red arm, white arm slightly slippery

Very poor

Examination and analysis

Date: 01/08/2023

Analysis september 2020: samples were taken from the exterior surface of the object for analysis by means of Ion Chromatography by G. Verhaar. The results show relatively high concentrations of Potassium. There has been an increase in Potassium concentration compared to the analysis in 2017.
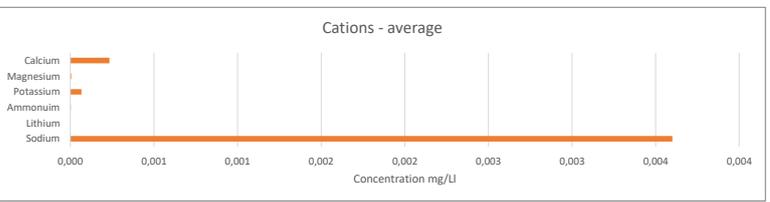
Likely unstable

Concentrations (mg/L)

Anions

	U	Ave	SD	RSD
Fluoride	19,00	0,014	0,013	0,968
Acetate	60,05	0,000	0,000	0,000
Formate	45,02	0,000	0,000	0,000
Chloride	35,45	0,129	0,068	0,530
Nitrite	46,01	0,000	0,000	0,000
Bromide	111,96	0,000	0,000	0,000
Nitrate	62,01	0,054	0,064	1,195
Carbonate	60,01	4,119	2,827	0,686
Sulfate	96,06	0,191	0,104	0,543
Phosphate	94,97	0,000	0,000	0,000
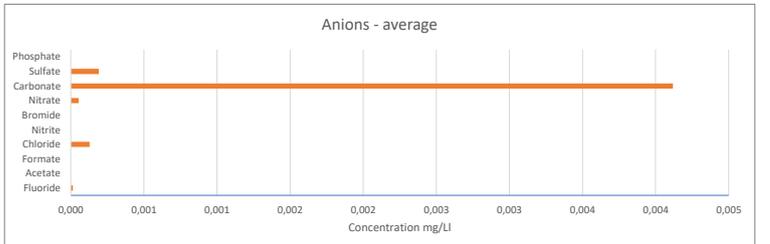
Cations

	U	Ave	SD	RSD
Sodium	22,99	3,600	1,346	0,374
Lithium	6,94	0,000	0,000	0,000
Ammonuim	18.04	0,003	0,003	1,041
Potassium	39,10	0,067	0,016	0,242
Magnesium	24,31	0,006	0,003	0,516
Calcium	40,08	0,234	0,094	0,401

Added Na and K concentrations

Sodium	22,99	156,591
Potassium	39,10	1,714
Total	µmol/L	158,305	Likely unstable
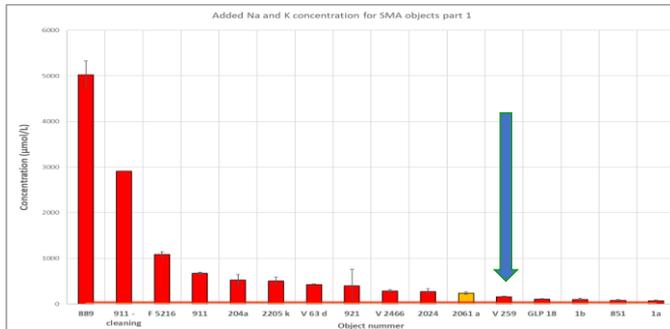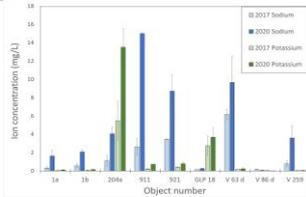
Categorisation total alkaly ion concentration µmol/L

IC-A	Likely stable	< 20
IC-B	potentially unstable	>20 <50
IC-C	likely unstable	> 50

Graphs and/or Tables

Anions - average

Cations - average

Added Na and K concentration for SMA objects part 1

Intepretation, questions and comments on results

The object was cleaned in 2011. In 2013 signs of drioplets were noticed. In 2020 it was mentioned that the object was *vettig;* some colours more than others. The object does now, in 2023, feel slippery again. Some colours more than others. Suspicious situation seen especially in colourless parts.

The results from the IC analysis show relatively high concentrations of Sodium. The ions noticed are different from the other objects so far in the IC group: no other anions than sulfate, carbonate and chloride noticed. Although carbonates are often found on unstable glass as well, the method of IC analysis is not very sensitive for carbonates (therefore high default margin). The high concentration of sodium is in line with the characteristics noticed during examination now: slippery surface.

In the two top graphs with representation of avarage concentrations of ions and cations, the standard deviation can be drawn from the raw data in the left tables, but is not inserted in the graphs. They are inlcuded in the last graph. In the bottom graph the LOQ line and red line indicate that this object falls within the IC-C ccategory. The red colour of the bar indiciates that the condition was assessed as being very poor during visual examination prior to sample taking. It shows that the signs visually noticed were in line with the IC results.

Not detected: F-, NO2-, Br-, NO3-, PO43-, Li+, NH4+, Mg2+. Sodium concentration is dominant compared to the concentration of Potassium. One species being dominant is usually the case when both species are present in unstable glass. Sulfate detected!

Suggestions further examination or analysis

* More information about the manufacturing process (artist interview) and comparison with possible similar objects in other collections
* Compositional analysis (XRF or other) to be able to combine data from visual examination with IC data and composition informatipon for even deeper understanding of condition.