



Investigating unstable glass in museum collections

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Two bottles, ca. 1<sup>st</sup>-3<sup>rd</sup> C., Metropolitan Museum of Art, NY

## Glass in museum collections

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Egyptian Tilapia Fish Bottle, ca. 1352-1336 BC, British Museum, London

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*Chalice*, 1550-1564, Gemeentemuseum, The Hague

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Plaque of Salomé presenting the head of John the Baptist, Pierre Courteys (I), prior to 1591, Rijksmuseum

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Portrait of a smiling girl, Edith Abadam (?), John Jabez Edwin Mayall, c. 1850– 1865, Rijksmuseum

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*Pyramid Perfume R204*, Colin Reid, 1986, Corning Museum of Glass, Corning, NY

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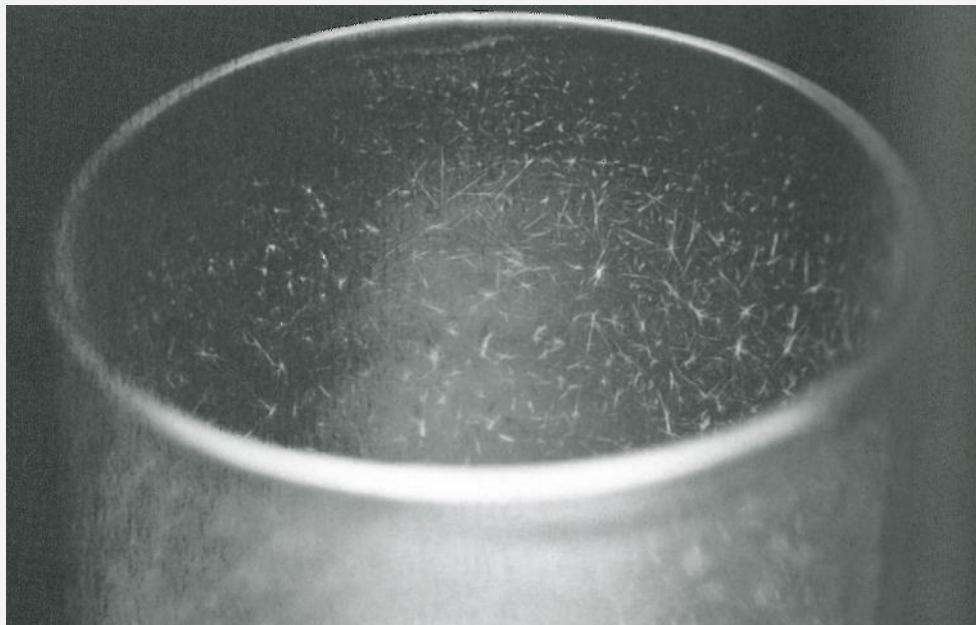


Moisture accumulation on the surface of a modern Irish Coffee glass, 1989, courtesy Margot van Schinkel

## Decay of glass in museum collections

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Sodium formate on a wine glass from the NMS (Cobo del Arco, 1999)

## Decay of glass in museum collections

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Crizzled Bowl, George Ravenscroft, Corning Museum of Glass, ca. 1680

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Crizzled Bowl, George Ravenscroft, Corning Museum of Glass, ca. 1680

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Fully crizzled and discolored bottle, Rijksmuseum Amsterdam, ca. 1700

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Moisture accumulation on the surface of a modern Irish  
Coffee glass, 1989, courtesy Margot van Schinkel

Sodium formate on a wine glass from the NMS (Cobo del Arco,  
1999)

Fully crizzled and discolored bottle, Rijksmuseum Amsterdam,  
ca. 1700

Crizzled Bowl, George Ravenscroft, Corning Museum of  
Glass, ca. 1680

Pitting and metal corrosion on a Limoges enamel plaque,  
Rijksmuseum, ca. 1500-1525

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1927



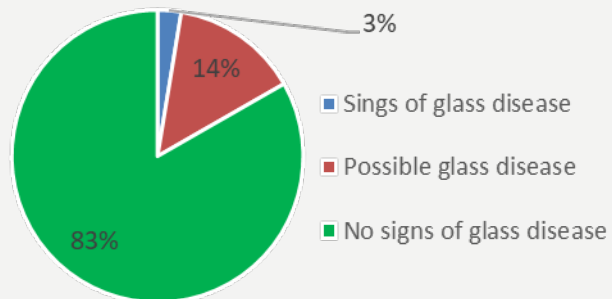
2004

## Categorization

- A. Perfect Condition
- B. Very slight surface changes
- C. Probable early stages of decay
- D. Clear symptoms of degradation
- E. Beyond restoration



## Rijksmuseum: surveying the glass collection



Source: Burghout en Slager (2013), *Rec. adv. in glass, stained-glass and ceramics cons.* Spa Uitgevers: Zwolle. pp. 327-9.

## Boijmans van Beuningen: surveying the glass collection



- Can we identify unstable glass objects in an early stage, before visible changes in appearance occur?
- Can we discriminate between actual glass deterioration and other surface blemishes?

## Initial research questions

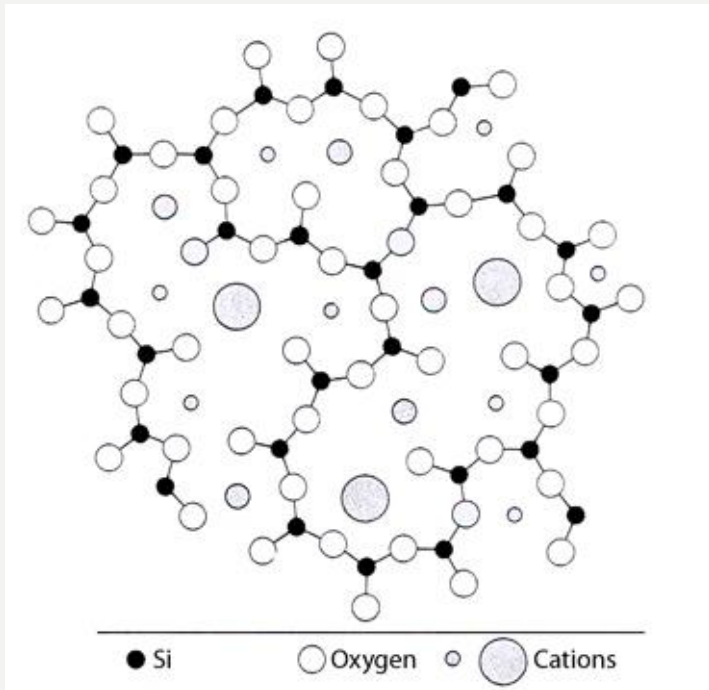
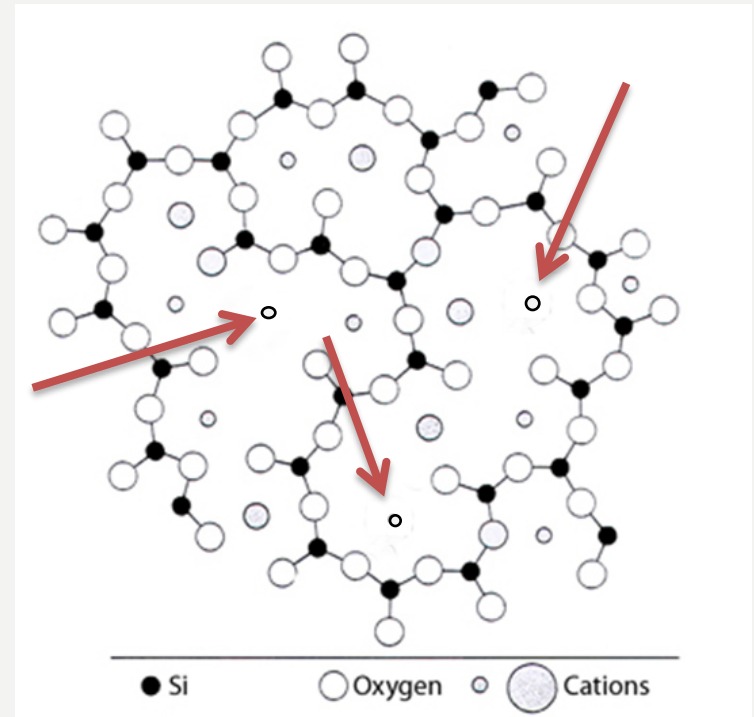
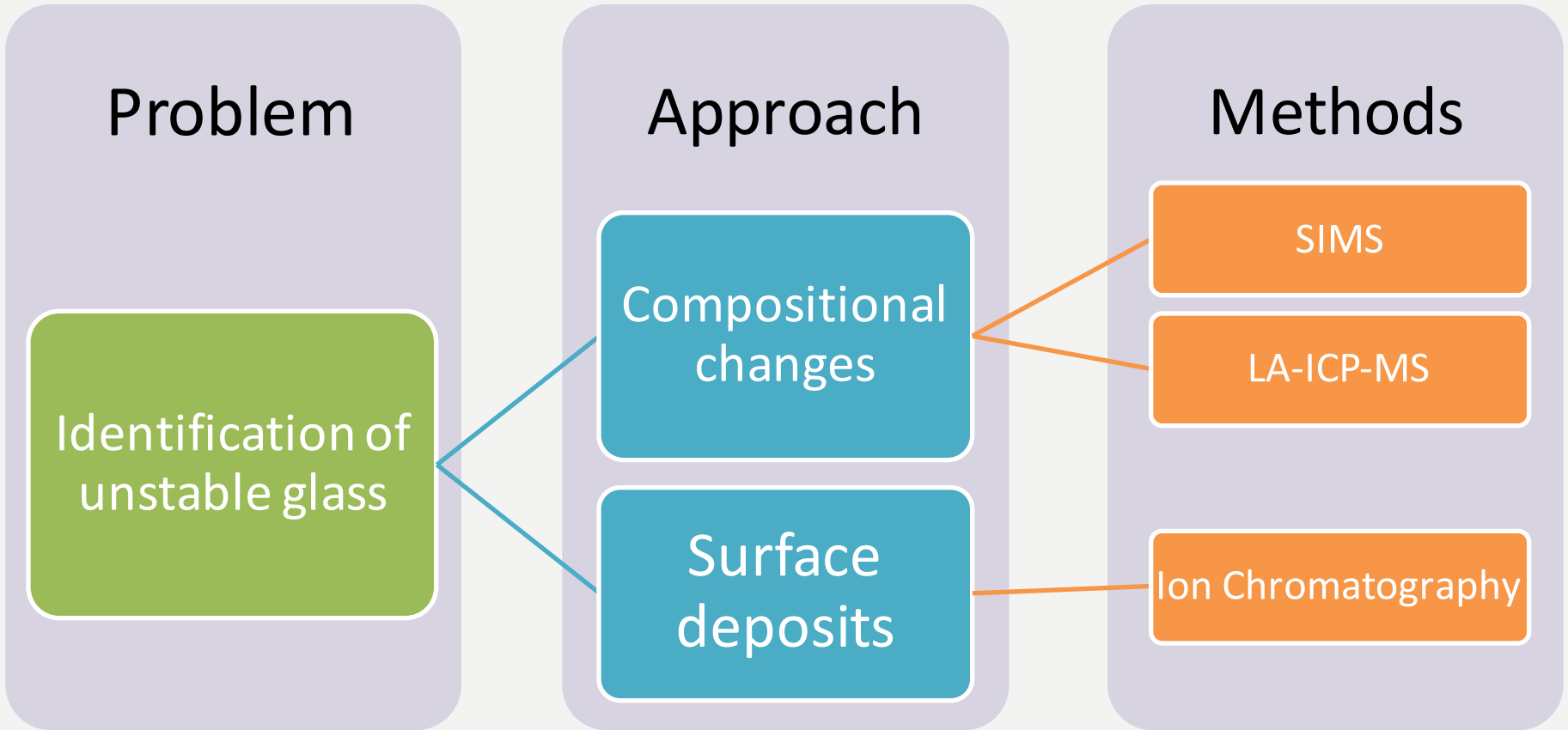


Image: Van London Co. <http://www.vl-pc.com/default/index.cfm/continuing-education/practical-ph-theory-and-use/.cfm>

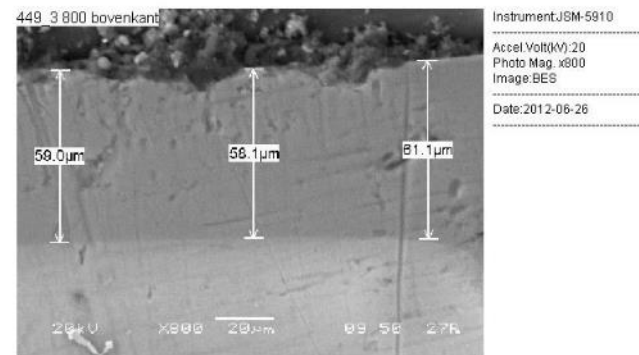
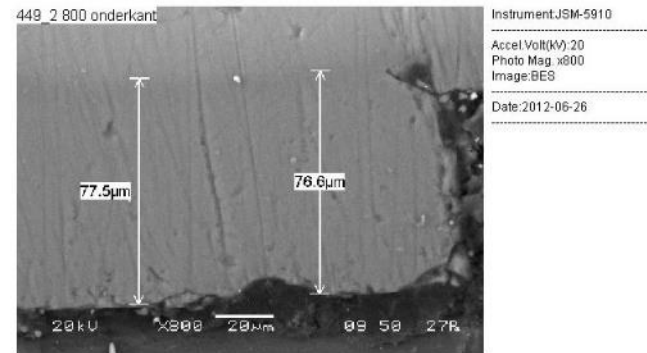
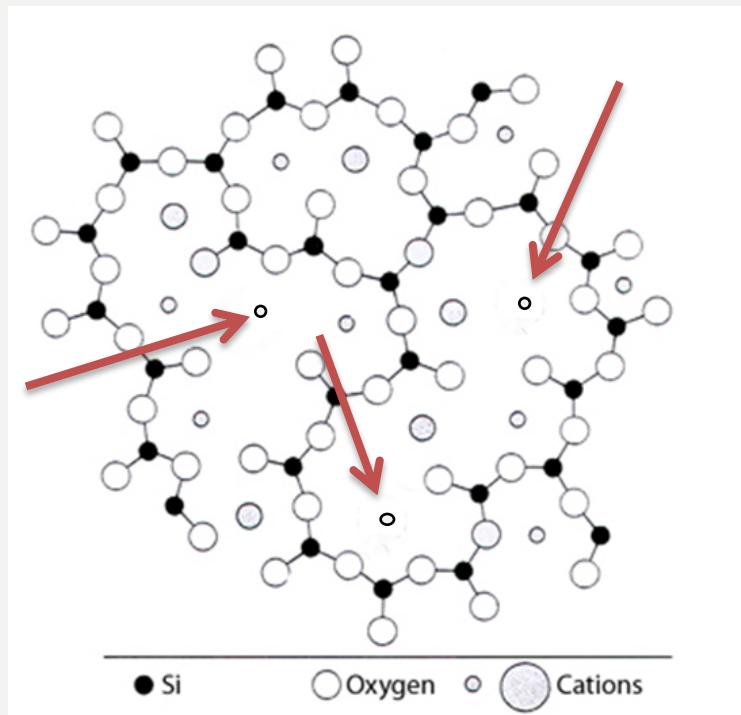


## Glass structure and alteration



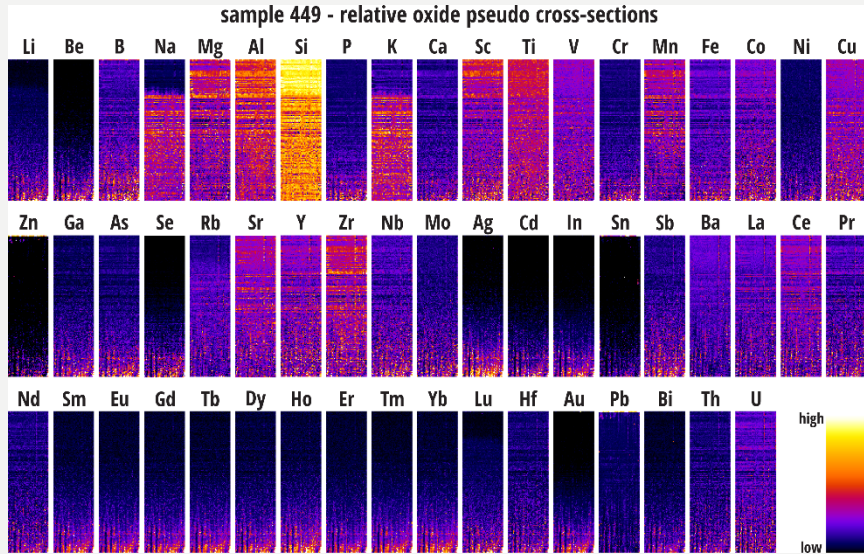
# Historic glass research: approach to the problem

# Alkali depletion in the surface layer

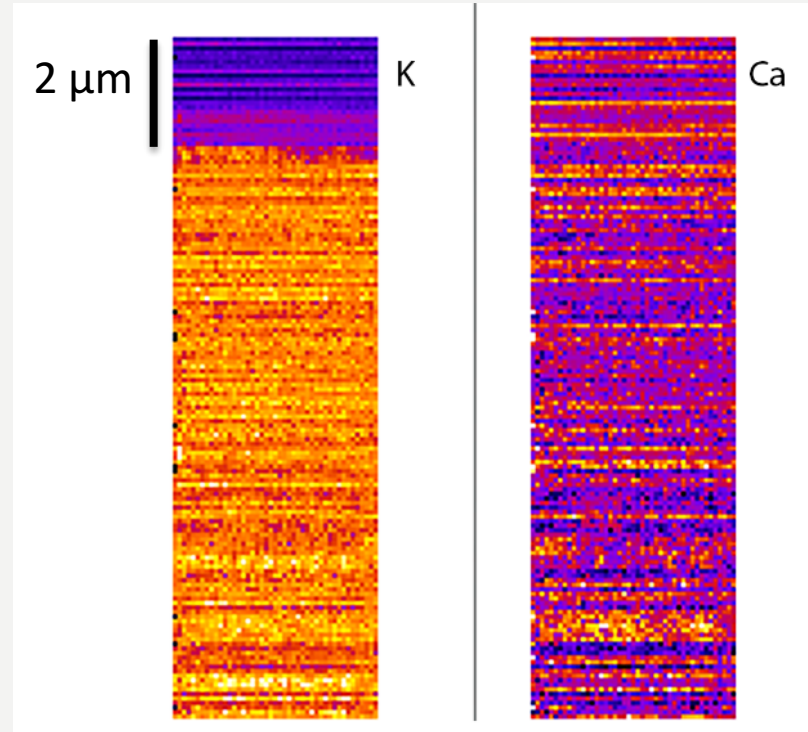


## Compositional changes

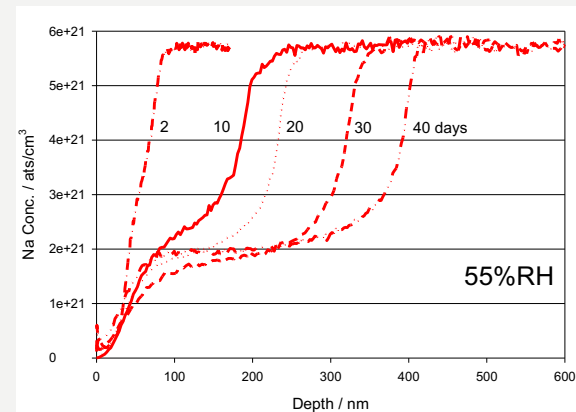
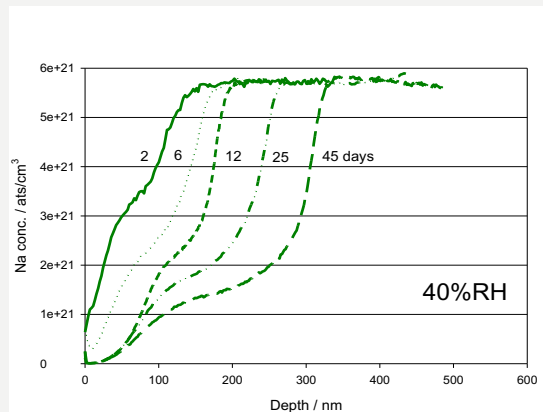
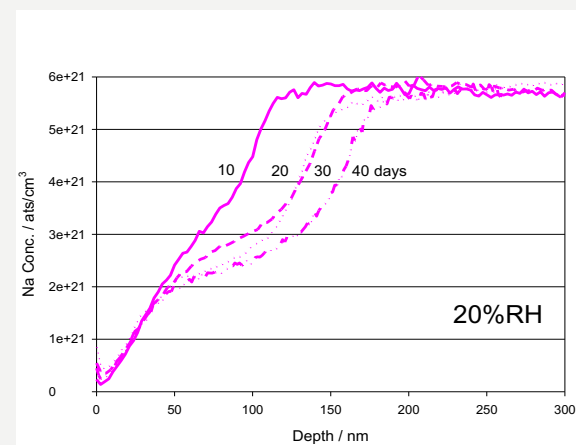
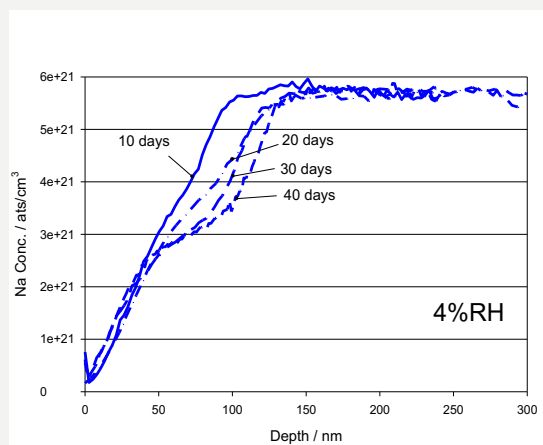
# Pseudo cross-sections



**Source:** Hans van Elteren & Vid Šelih, National Institute of Chemistry, Ljubljana, Slovenia

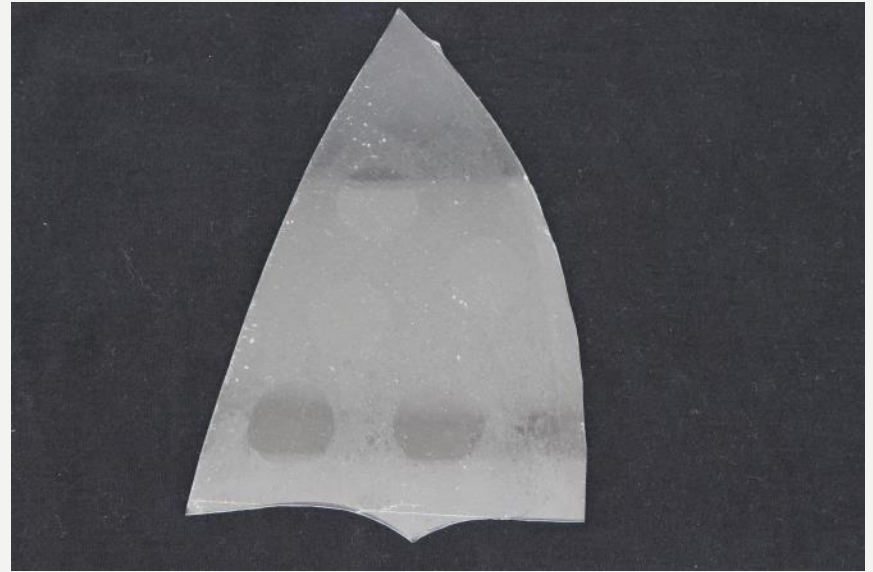
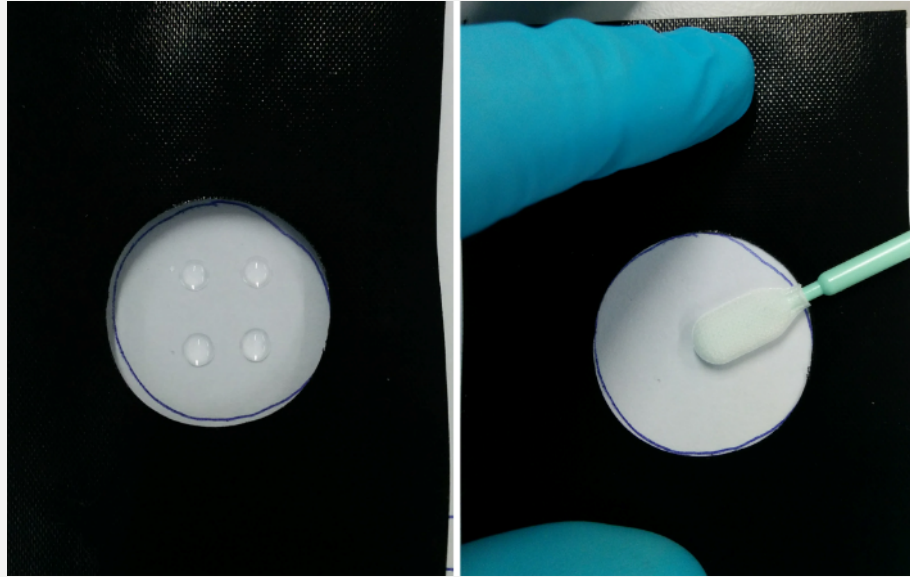


## LA-ICP-MS analysis of unstable glass



Source: Fearn (2004), Leverhulme Research Report

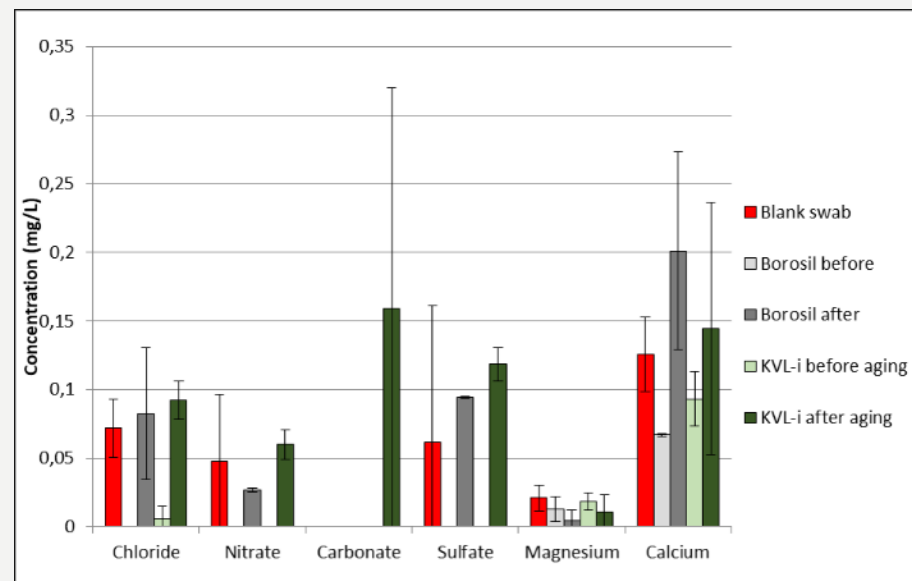
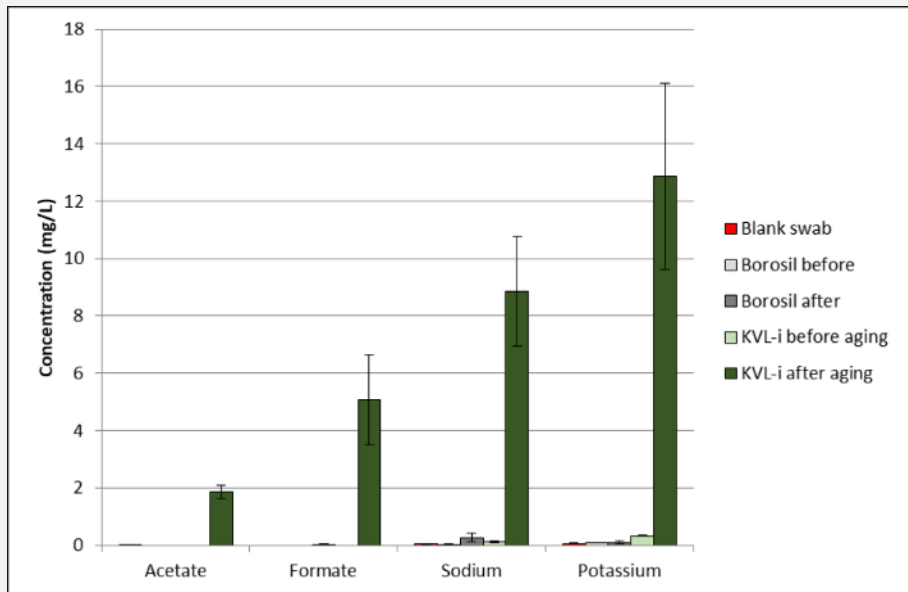
# SIMS analysis of unstable glass



Source: Verhaar (2018), *Glass sickness: detection and prevention*. Phd dissertation, University of Amsterdam

## IC analysis of ionic species on the surface of unstable glass

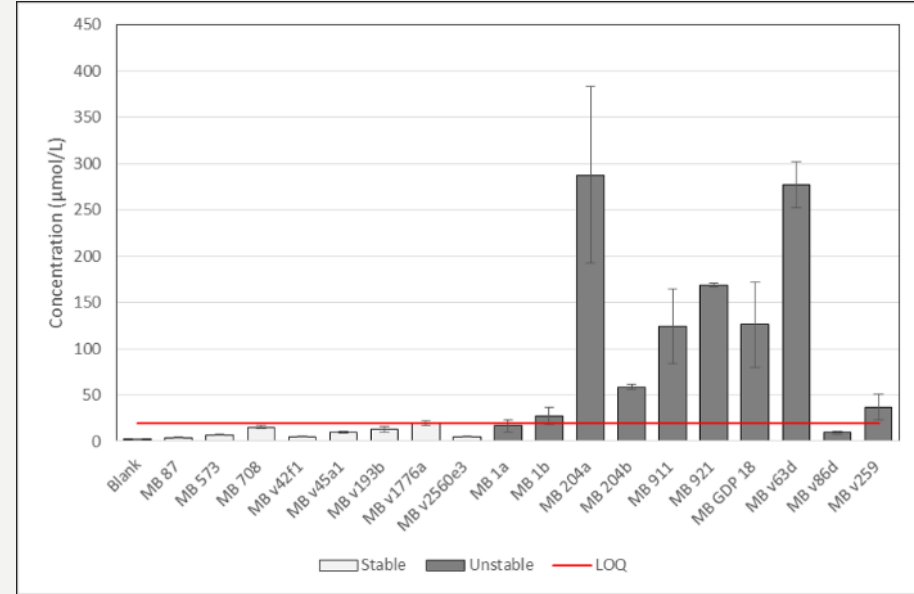
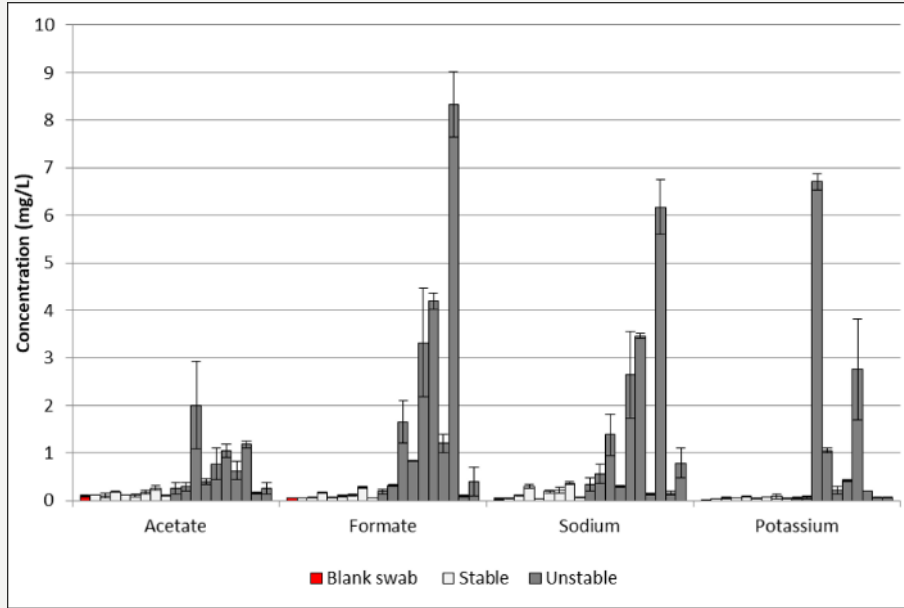
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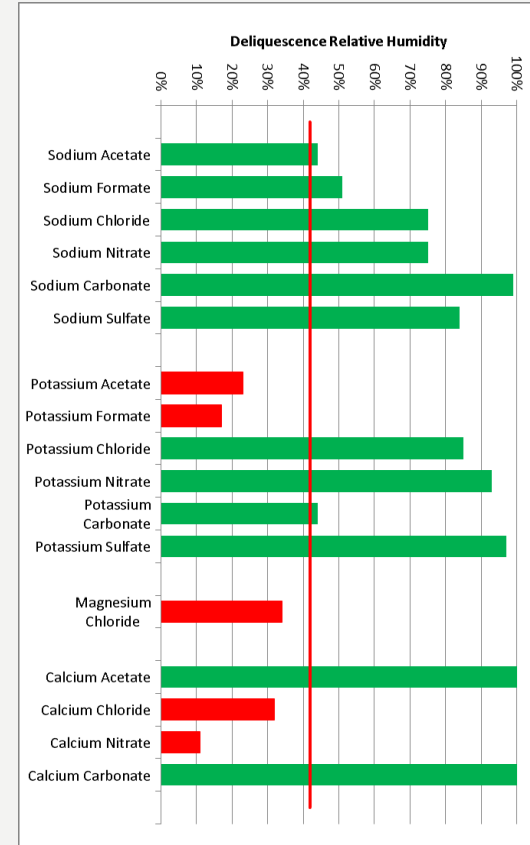
## IC: Artificial Ageing experiments



# Museum Boijmans Samples

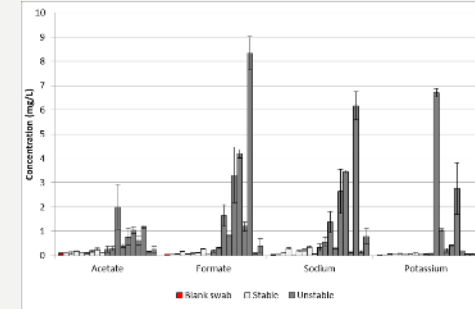
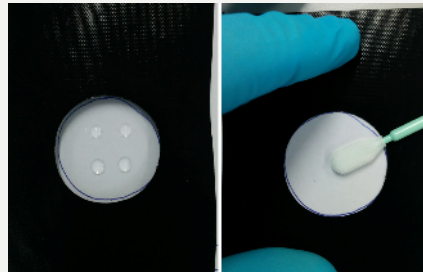
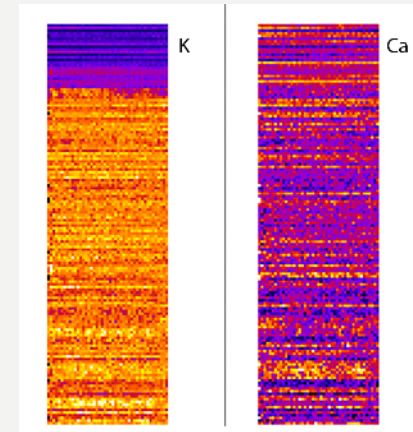
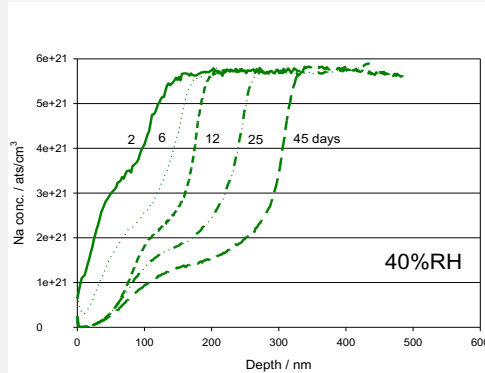


## IC: Museum Objects



## Recommendations for storage conditions

- Alkali depletion well-studied
- Identification of ionic species possible
- Early warning system still in development



## Conclusions

Compositional  
Changes

Surface  
Deposits

Integrated  
approach

## Future work

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## Principal glass deterioration research centers

# THANK YOU FOR YOUR ATTENTION

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