



Understanding the browning phenomenon of medieval stained-glass windows: impact of bacteria and bacterial exudates on the dissolution of a Mn-bearing glass

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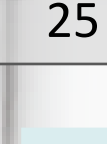
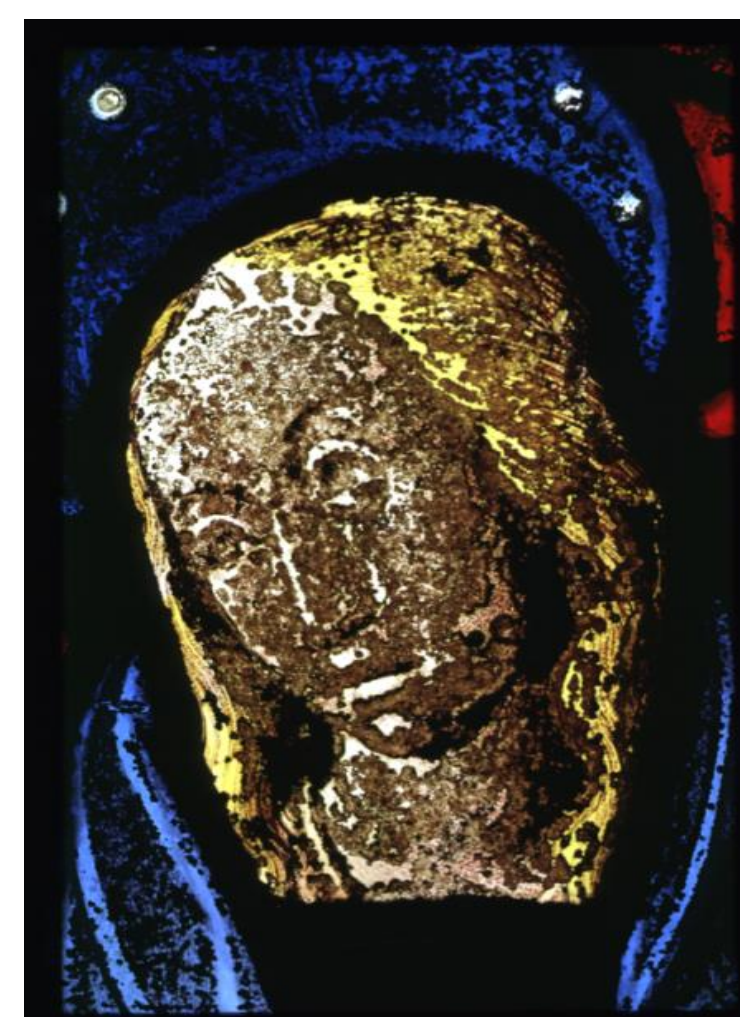
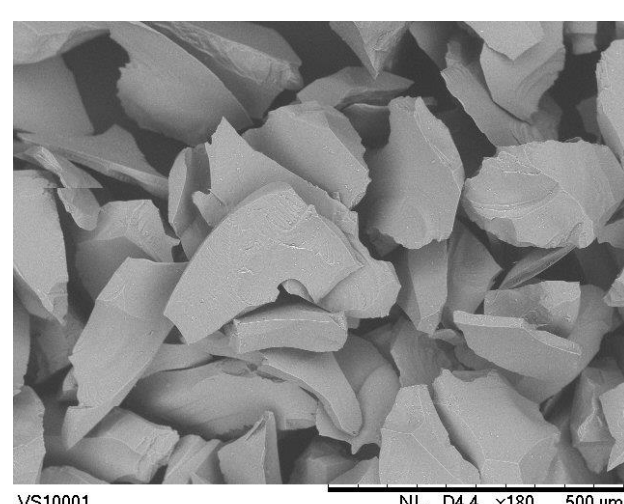


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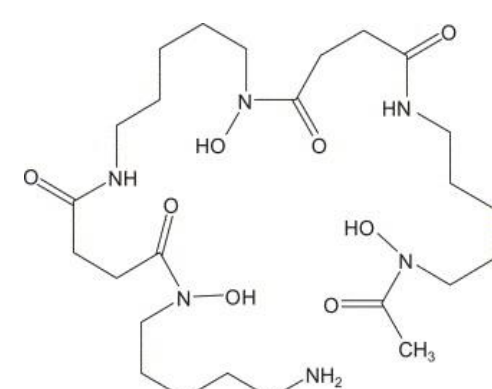
	Wt %	mol %
SiO ₂	51.1	54.7
Al ₂ O ₃	1.8	1.1
P ₂ O ₅	3.6	1.6
Na ₂ O	1,2	1.3
CaO	17.2	19.8
MgO	4.2	6.7
K ₂ O	18.8	12.9
MnO	2.08	1.9



25 ° C - 160 rpm

100 mg in 200 ml
 $\rightarrow S/V = 0,2 \text{ cm}^{-1}$
 Starting pH: 6,8

- OC(=O)C(=O)O



pH measurement ICP-OES analysis UV-VIS spectroscopy

Figure 1 is a line graph showing the NL (mg/m²) of five elements (Si, Ca, Mg, Mn, K) over a 2-day period. The y-axis represents NL (mg/m²) ranging from 0 to 0.6. The x-axis represents time in days, ranging from 0 to 2. The legend indicates the following elements and their corresponding symbols:

- Si NL: Blue line with diamond markers
- Ca NL: Red line with square markers
- Mg NL: Green line with triangle markers
- Mn NL: Purple line with cross markers
- K NL: Cyan line with plus markers

The graph shows that the NL of all elements increases over time. Ca and Mg show the highest NL values, while Si shows the lowest. Error bars are included for each data point.

Day	Si NL (mg/m ²)	Ca NL (mg/m ²)	Mg NL (mg/m ²)	Mn NL (mg/m ²)	K NL (mg/m ²)
0	0.02	0.05	0.05	0.02	0.05
0.25	0.05	0.10	0.10	0.05	0.10
0.5	0.10	0.18	0.18	0.10	0.18
1.0	0.25	0.40	0.40	0.25	0.40
2.0	0.40	0.52	0.52	0.40	0.52

Si

NL (g/m²)

days

Control
OA 1 mM
DFOB 500µM

days	Control (g/m ²)	OA 1 mM (g/m ²)	DFOB 500µM (g/m ²)
0	0.0	0.0	0.0
0.25	0.05	0.1	0.05
1.0	0.25	0.45	1.0
2.0	0.4	0.65	2.1

3 wells: Control experiment
glass in culture medium MM9

3 wells: Biotic dissolution experiment
glass in culture medium MM9 and bacteria

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