



Design and chemical composition of the Bohemian glass produced from 14th till 18th century

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Introduction

Beginning of the glass production in Bohemia area is dated to the 12th century AD. The source of technological knowledge came from west Europe, where the potassium glass ($K_2O-CaO-SiO_2$) production started around 8th century AD [1-3]. In Bohemia, so called woodash glass (from two compounds) was not produced, but our forefathers produced woodash-potash glass very early (potash was leaching mainly from beech ash)[2]. Our laboratory had a possibility to restore and analyze the archaeological glasses from the houses waste sumps from the towns Chrudim, Hradec Králové, Opava and castle Košumberk. Chemical analyses were made both by SEM/EDS (in case of too small amount of sample) and XR Fluorescence methods (in case of the glass pieces without any corrosion symptom and a sufficient sample amount).

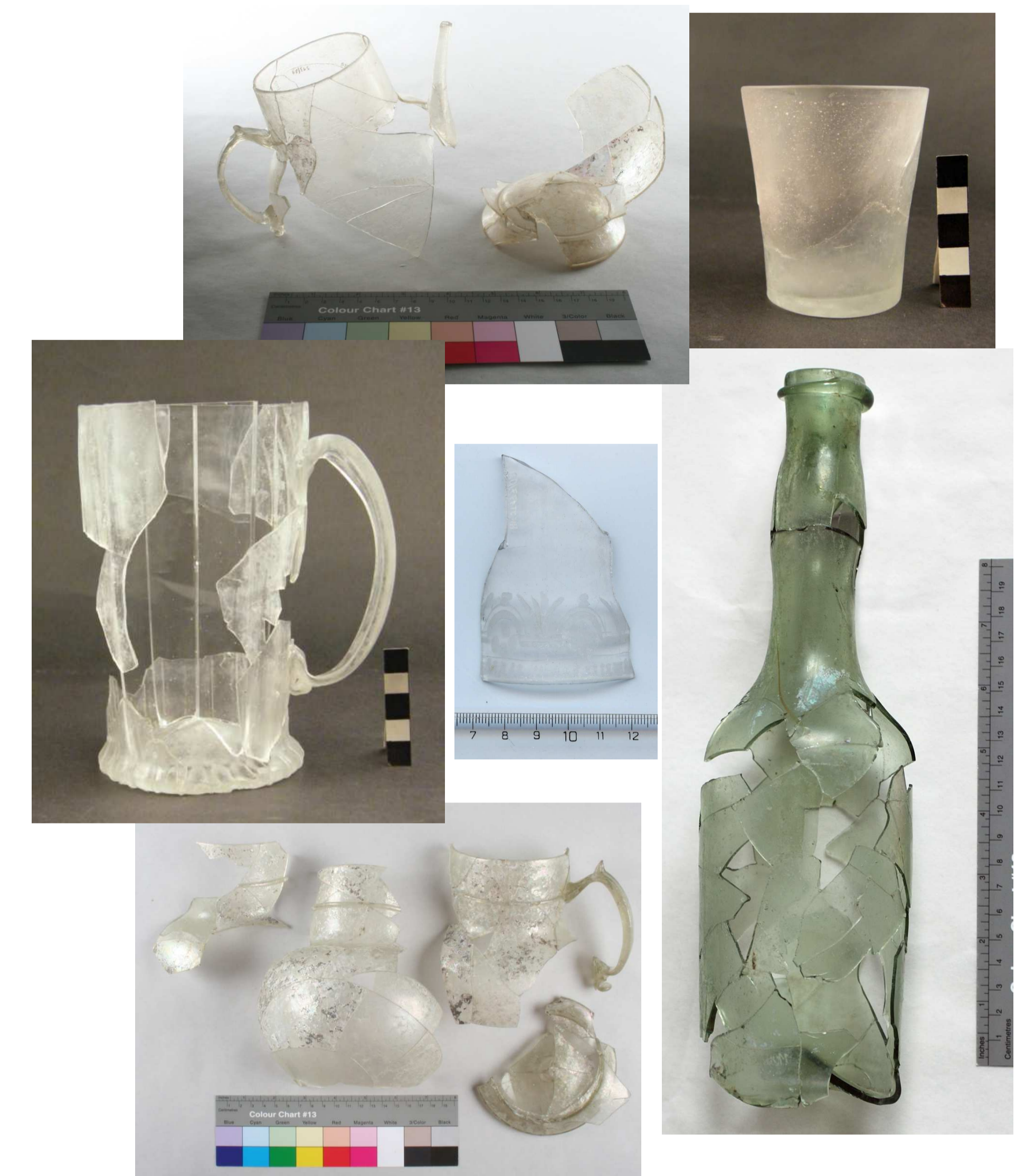
Gothic style (14th - 15th AD)



Renaissance style (16th - 17th AD)



Baroque style (18th AD)

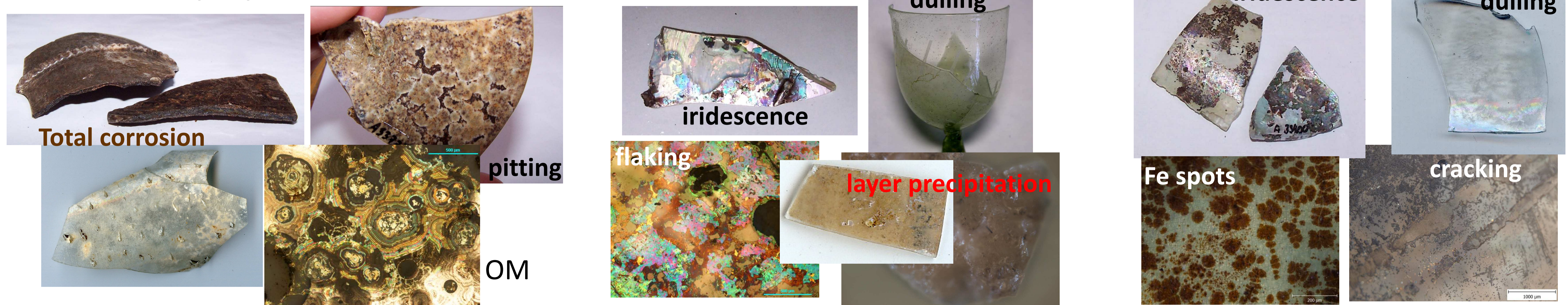


Chemical composition, average values [wt%]

SEM/EDS, XRF

oxide	SiO ₂	K ₂ O	CaO	MgO	Na ₂ O	MnO	Al ₂ O ₃	P ₂ O ₅	Fe ₂ O ₃	SO ₃	Cl	As ₂ O ₃	K ₂ O/CaO
gothic	58,0	19,9	15,4	2,5	0,2	0,9	1,5	1,0	0,3	0,3	0,1		1,3
renaissance	60,7	13,7	17,2	2,2	1,1	1,0	1,8	1,0	0,5	0,2	0,2		0,8
baroque	74,8	13,4	9,6	0,2	0,9	0,1	0,2	0,1	0,1	0,2	0,2	0,3	1,4

Corrosion symptoms



Raw materials [3]: SiO₂ (mainly quartz): beech ash: potash, later CaCO₃ or Ca(OH)₂

Ratios of raw materials in the batch [weight portions on 100 kg SiO₂]

Style/ingredients	SiO ₂	beech-ash	potash	CaCO ₃	As ₂ O ₅	MnO ₂	NaCl
gothic	100	70/80	30/20	0	0	0	0
renaissance	100	40/50	20/20	10/20	0	0	0
baroque	100	0	25	25	0,5	0,34*	0,25

Conclusions

* [3]

- chemical composition of the bohemian drinking glasses have been changed simultaneously with the historical style changes (gothic, renaissance, baroque)
- the content of P₂O₅ (around 1 wt%) in the archaeological glass is the most important indicator of using beech ash
- gothic glass has the worst chemical durability, corrosion is heaviest (total corrosion and pitting)

Reference

- [1] Wedepohl K.H.: Glastechnol. 70(8) 246-255, 1997.
 [2] Cílová Z.: Sklář a keramik, 60(910-12): 199-204, 2010.
 [3] Drahotová O., et al: Historie sklářské výroby v českých zemích I, Academia, Praha, 2005.

Acknowledgments

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