

Institute of Chemical Technology, Prague
Department of Glass and Ceramics



**INFLUENCE OF WATER ON GEOPOLYMER MORTARS
ON THE BASIS OF CZECH FLY ASH**

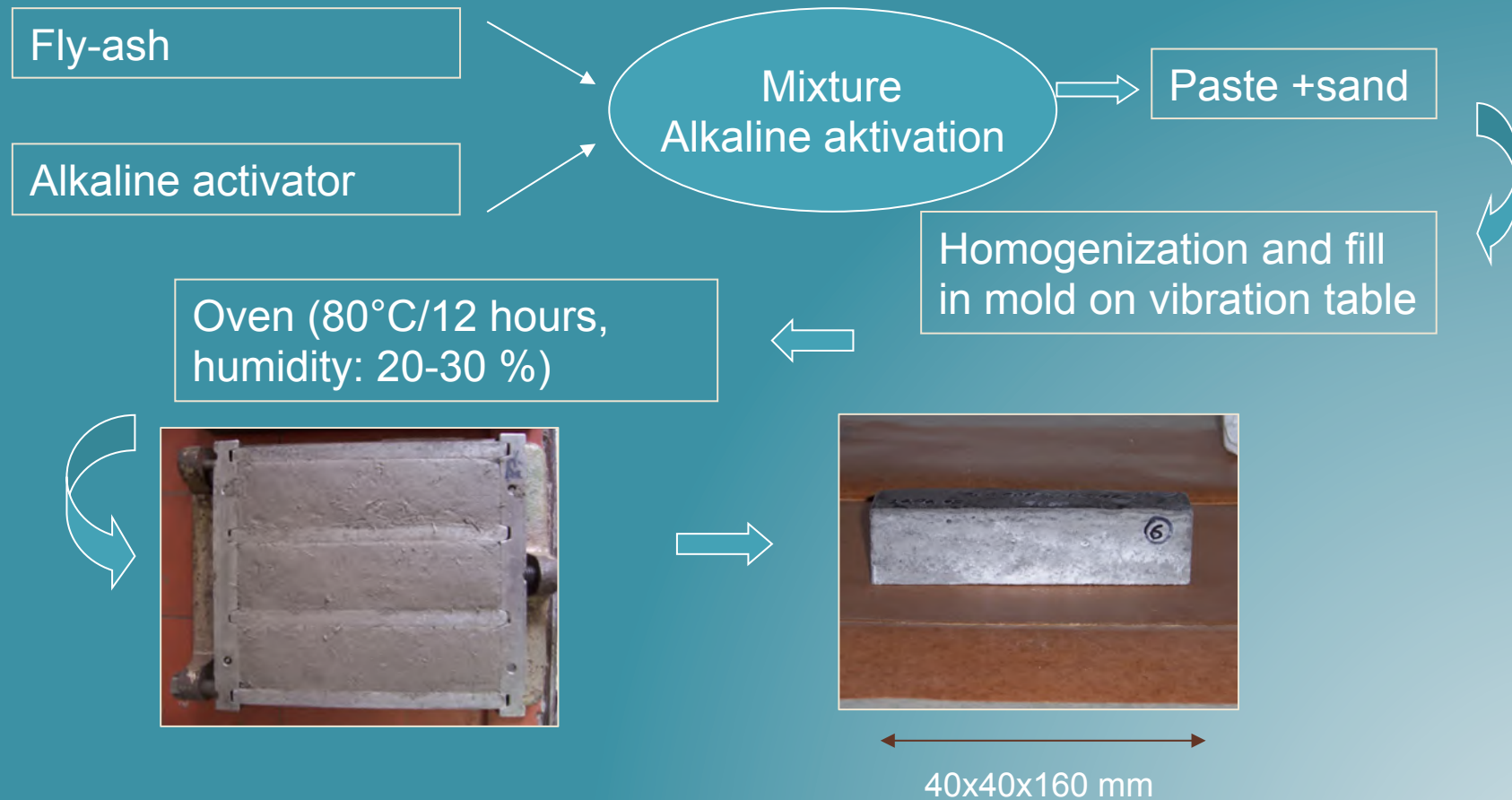
Nguyen Anh Duong Ing.

Supervisor: Doc. RNDr. František Škvára, DrSc.

Goal of the Investigation

The main goal of our investigation was systematic study of the long-term effect of external environment on mechanical properties of mortars containing binder on the basis of geopolymer.

How did we prepare?



After 7 days in laboratory conditions (at 25°C, humidity 45-50 %), specimens were exposed in needed environment

Raw material

Table 1: Composition of Czech brown fly-ash Opatovice v hm. %, type F

Flyash	Oxid [%]											z.ž.
	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	K ₂ O	Na ₂ O	TiO ₂	P ₂ O ₅	Spal. Látky	
Opatovice	52,85	31,84	7,34	2,12	1,14	0,41	1,69	0,36	1,51	0,21	0,53	0,74

Ratio of SiO₂/ Al₂O₃= 1,67

Table 2: Chemical composition of water glass

Oxid	SiO ₂	Na ₂ O	H ₂ O
%	24-27	14-17	55-60

Pure sand. With ratio fly-ash/sand =1:1,5.

Characterization of alkaline activator

- Silicate modul of alkaline activator
- Water coefficient: w
- Content of Na_2O in alkaline activator

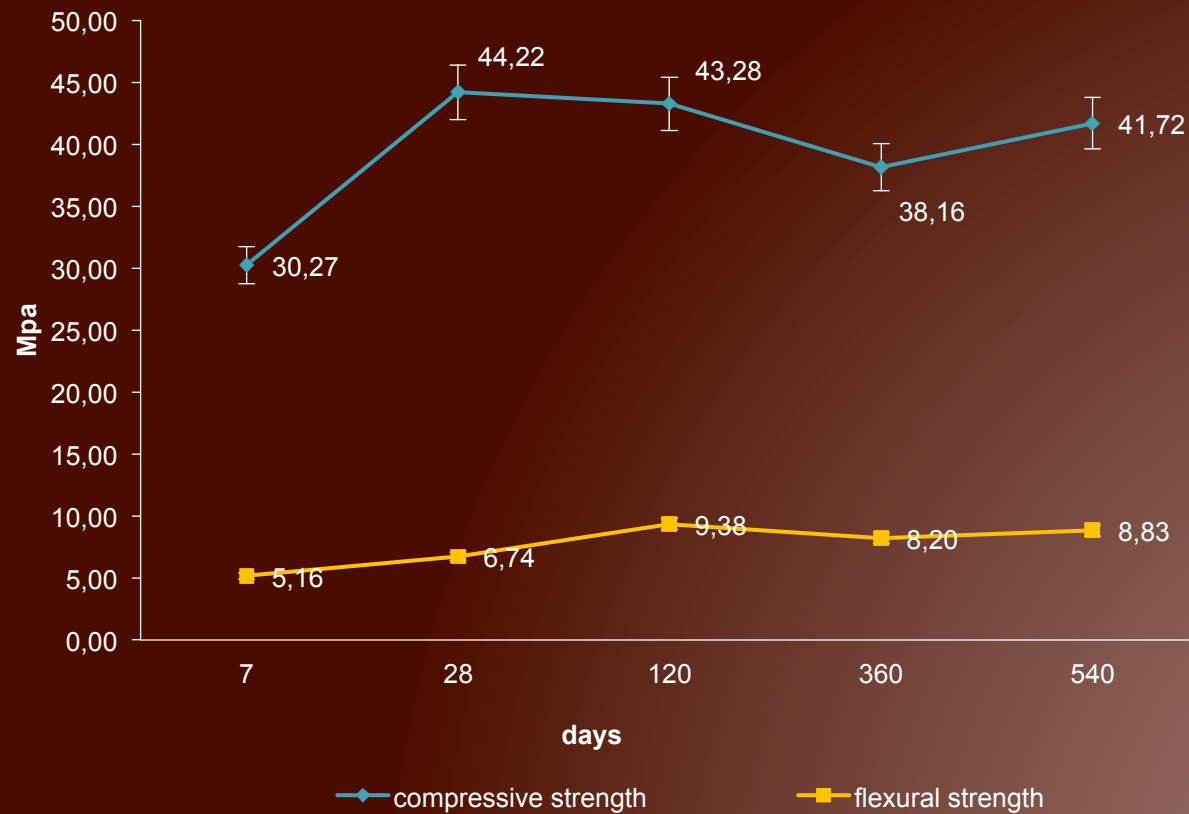
$$M_s = \frac{\text{SiO}_2}{\text{Na}_2\text{O}}$$

Na-water glass

Fixed composition $M_s = 0,75$
 $\% \text{Na}_2\text{O} = 7$
 $w = 0,33$

Experimental results

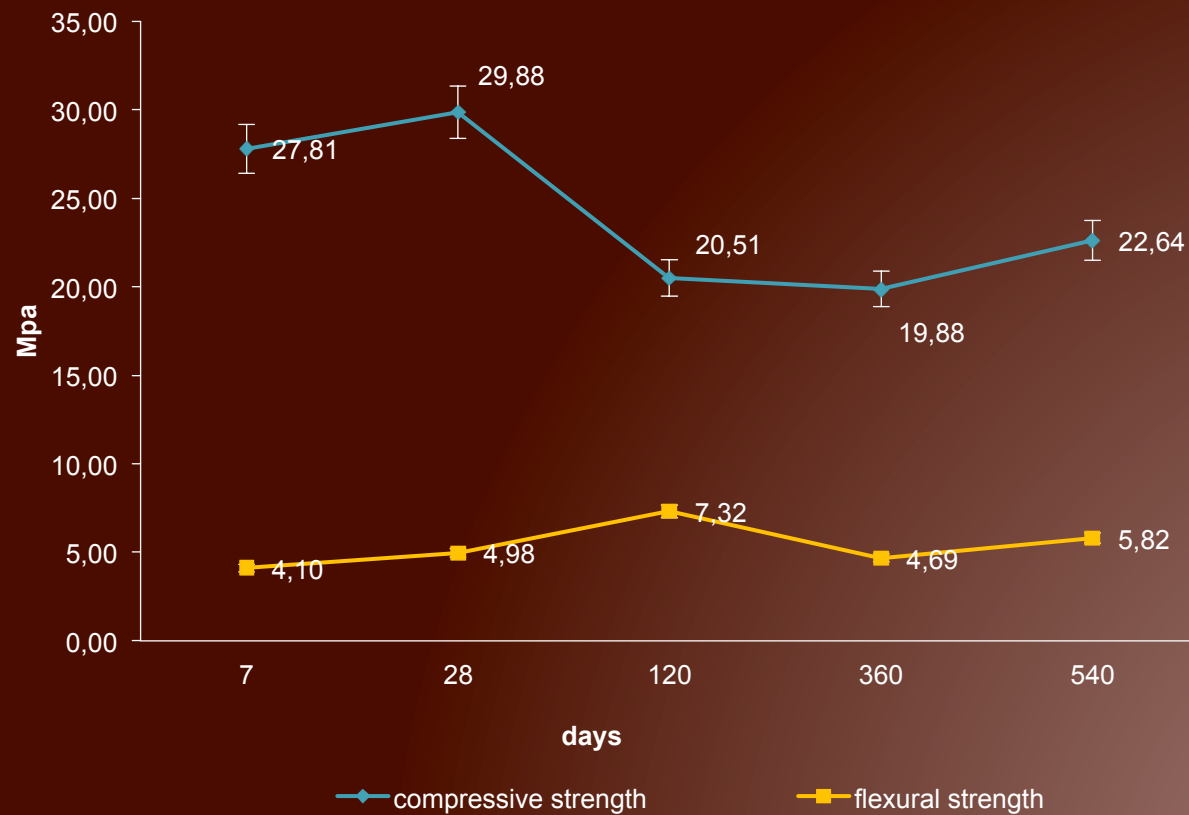
1. Strength of specimens exposed in laboratory conditions



Graph 1 At laboratory temperature (about 22°C), RH. 45-50

Experimental results

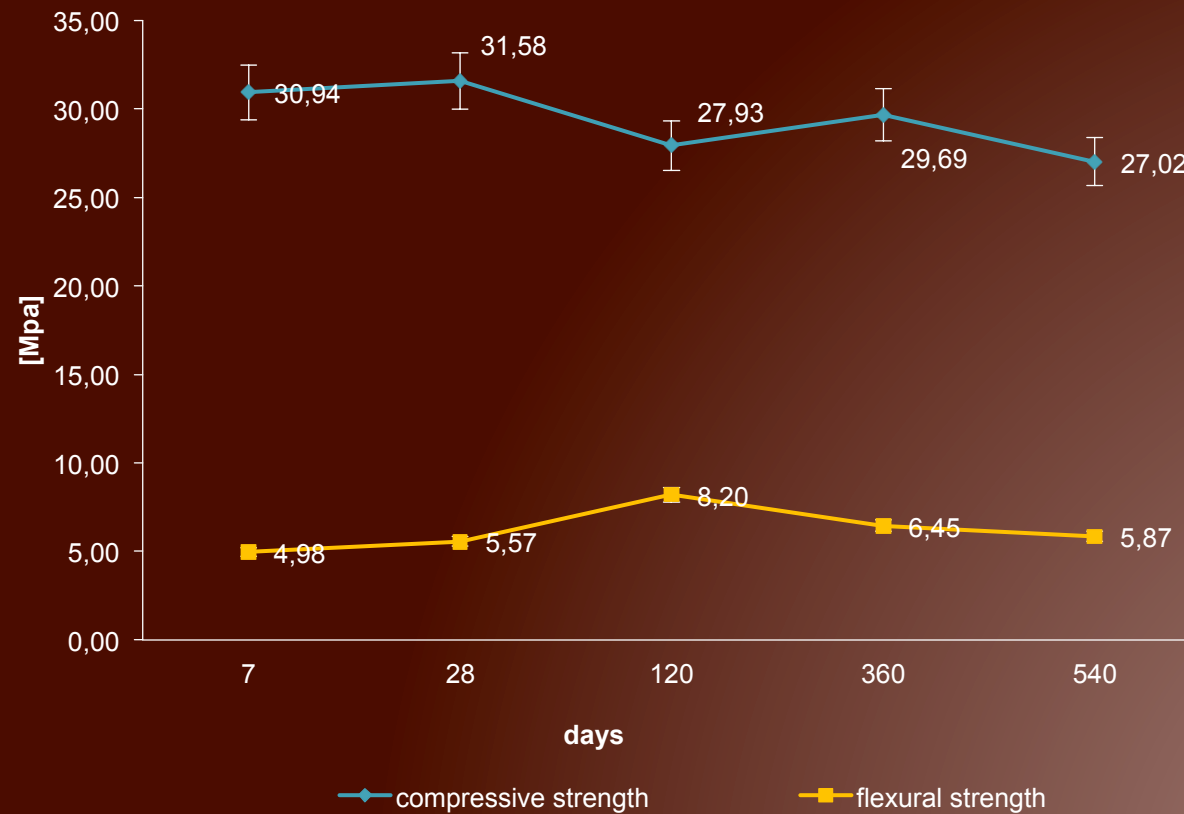
2. Strength of specimens exposed in water



Graph 2 In water

Experimental results

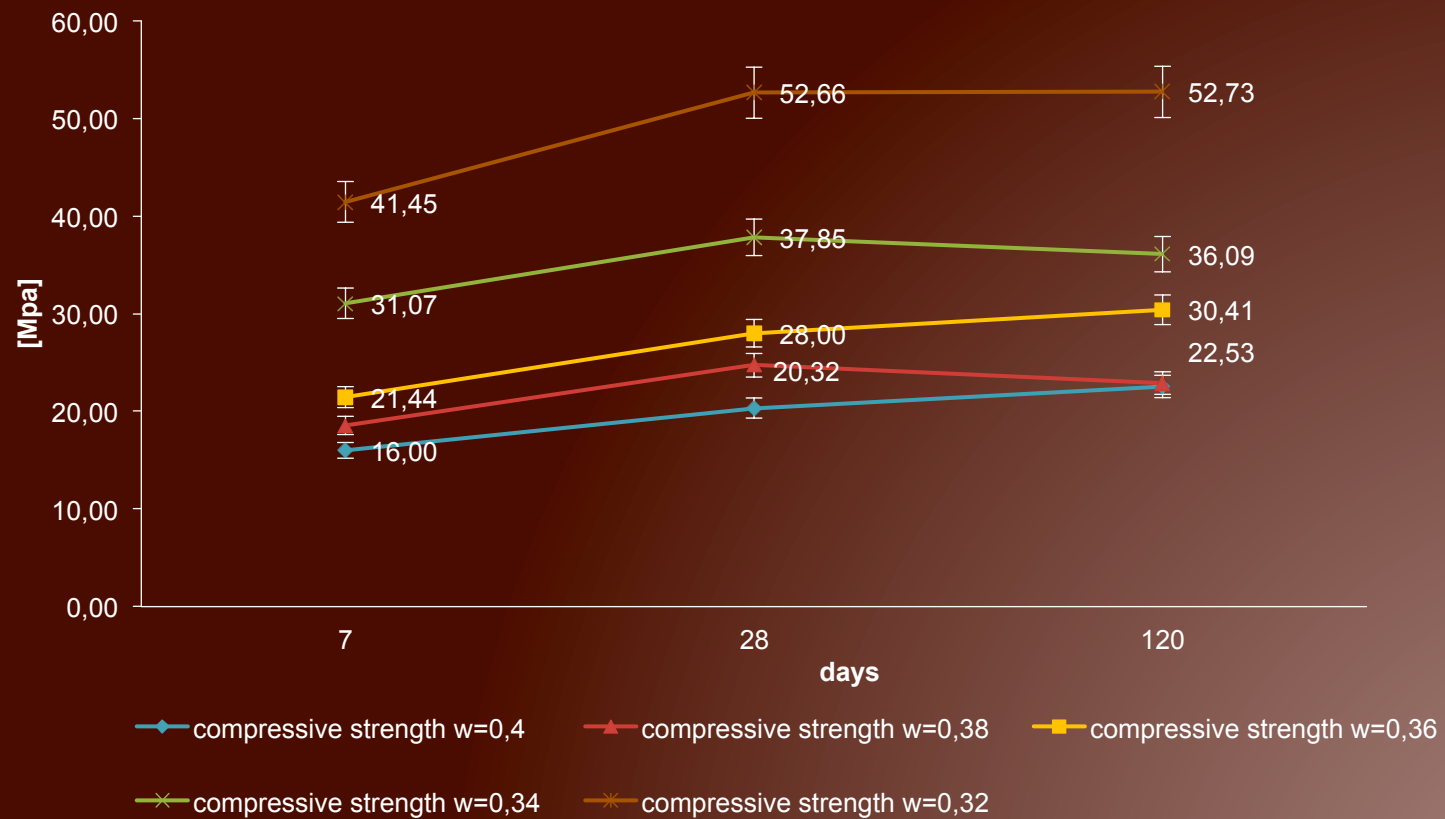
3. Strength of specimens exposed in humidity 98% and 25°C



Graph 3 In humidity 98%, at 25°C.

Experimental results

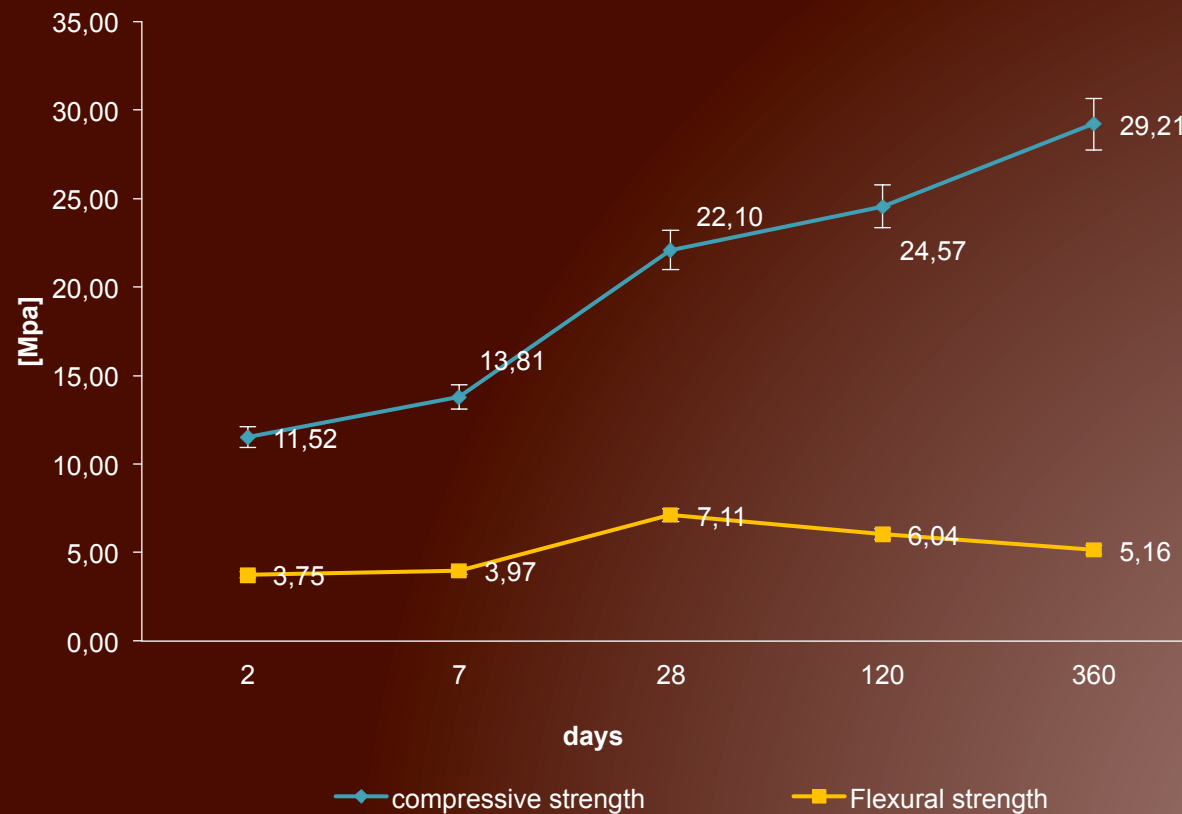
4. Impact of water coefficient on strength



Graph 4 Water coefficient.

Experimental results

4. Action of NaOH (specimens without water glass)



Graph 5 Action of NaOH in different times

Thank for your attention

This study was part of research program MSM 6046137302 “Preparation and research of functional materials and material technologies using micro- and nanoscopic methods”

„Financial support from Specific University Research (MSMT No. 21/2011)“.