

Effect of biomass ashes from selected fillers of thermal power plants on properties of geopolymers

Artem Sharko, Su Le Van, Nguyen Van Vu, Petr Louda,
Katarzyna Buczkowska, Tomáš Špirek

Introduction

- Seven types of biomass fly ash from six different power plants in Czech Republic were selected for a parametric study. The proportions of fly ash with metakaolin varied from 0.5 to 1. These types of fly ash were collected from power plants with a combustion temperature range of 615°C to 835°C.
1. biomass fly ash collected in Loučovice CHP at 835°C
 2. biomass ash collected in Loučovice CHP at 615°C
 3. fly ash from the heating plant in Český Krumlov
 4. fly ash from the thermal power plant in Písek
 5. fly ash from the heating plant in Otín
 6. fly ash from a thermal power plant in Mydlovary
 7. fly ash from the heating plant in Trhové Sviny

Introduction

- The aim of the study was also to establish a connection between the chemical composition and the properties of fly ash. Using the method of scanning electron microscopy X-ray spectroscopy, compression strength, flexural strength, and impact strength of the sample were examined.

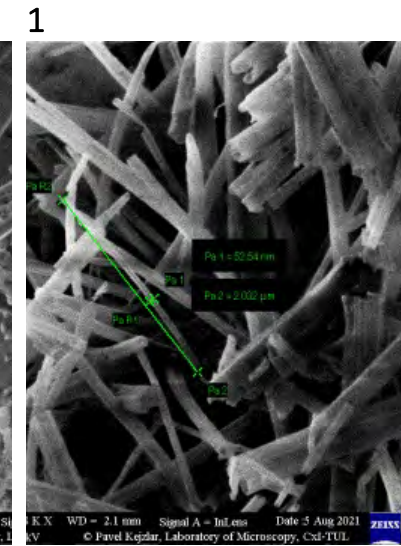
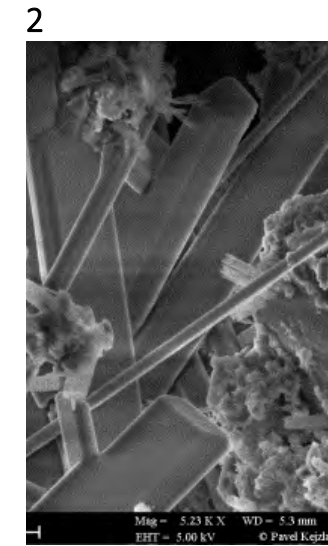
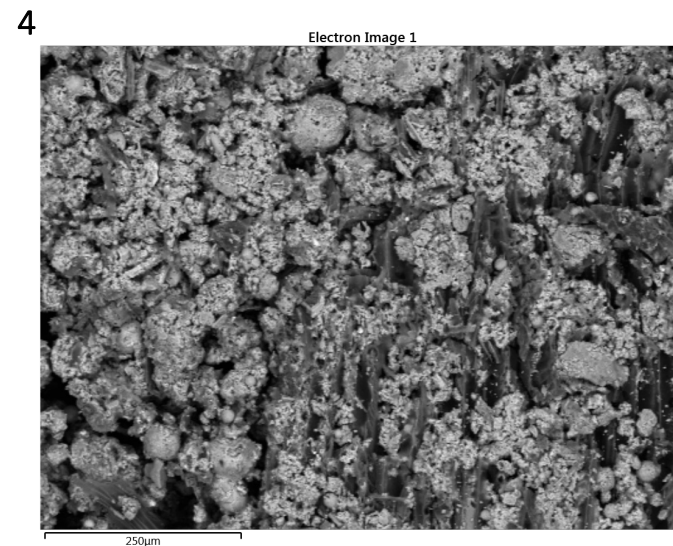
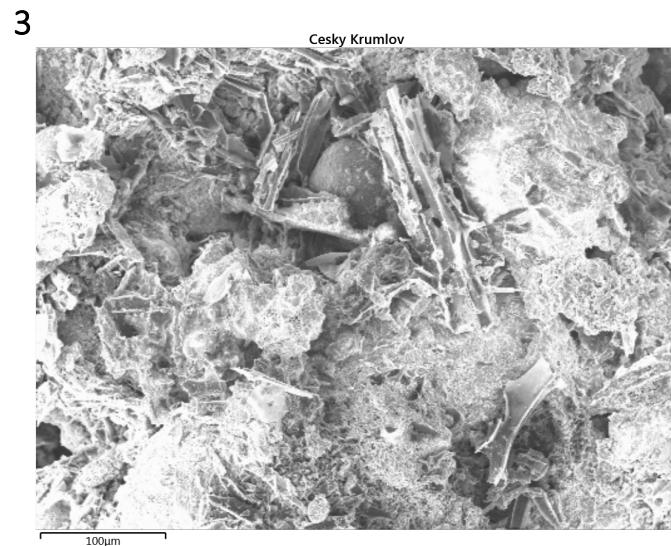
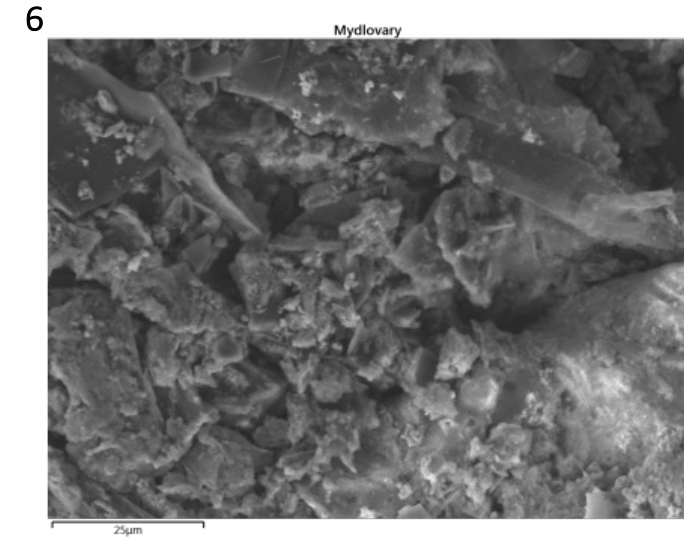
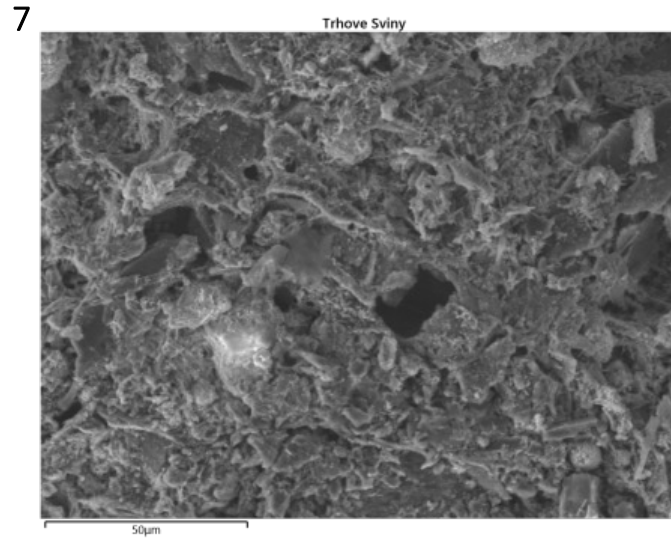
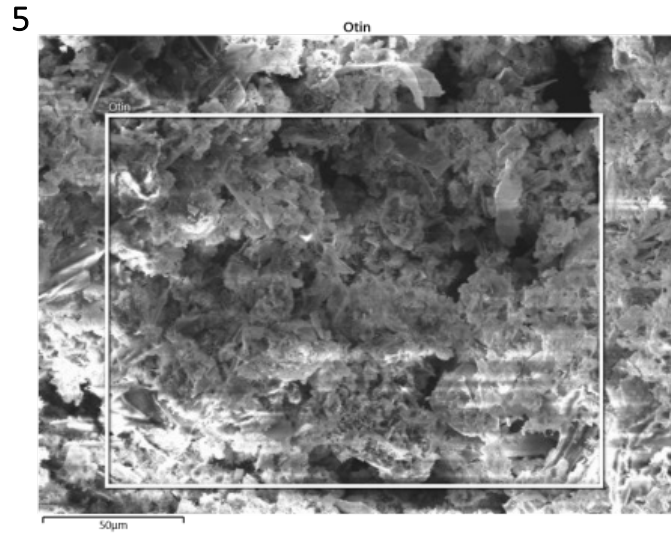


Biomass ash

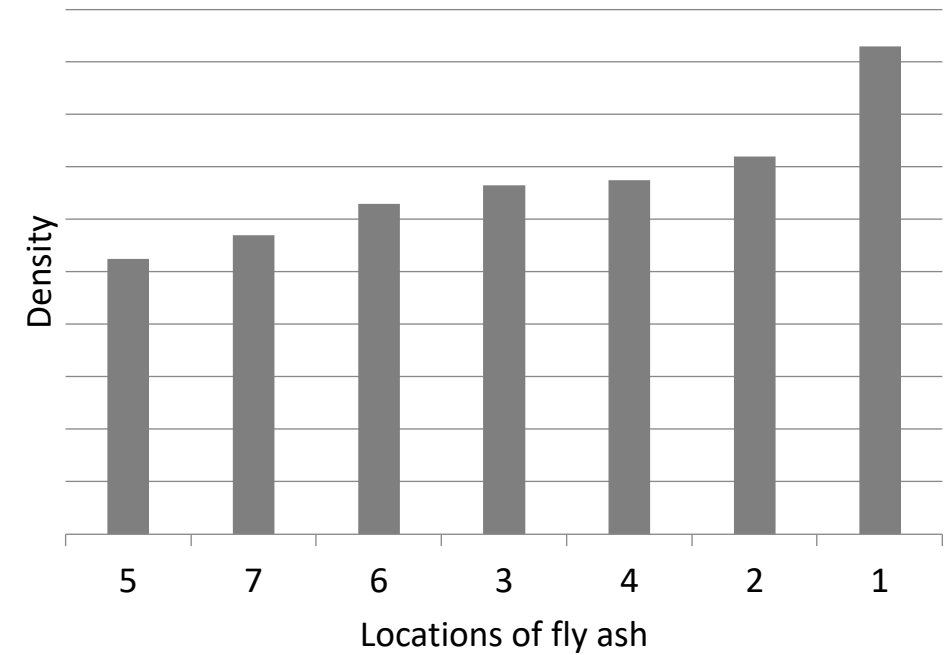
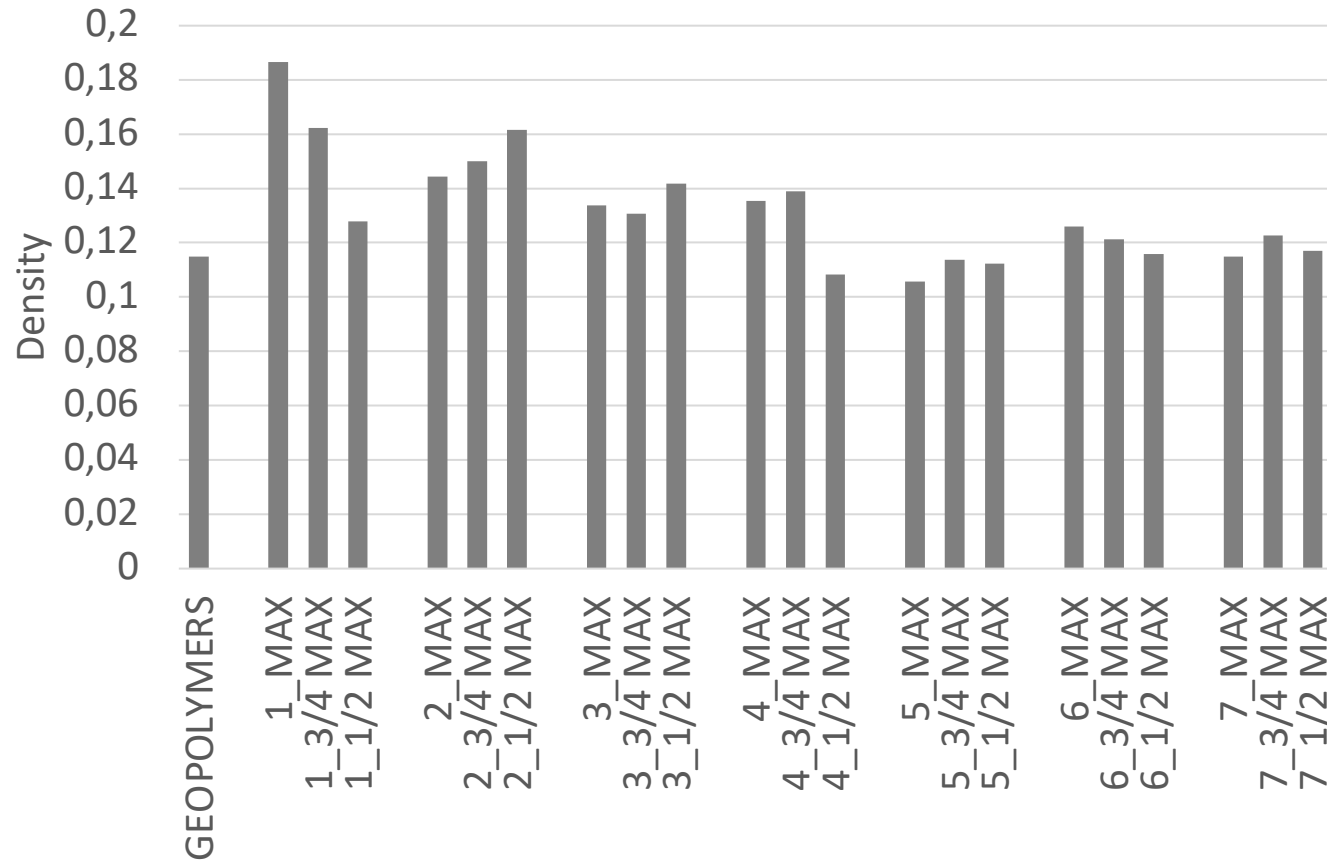


Carbon fiber

Microstructure of fly ash collected from various thermal power plants in the Czech Republic

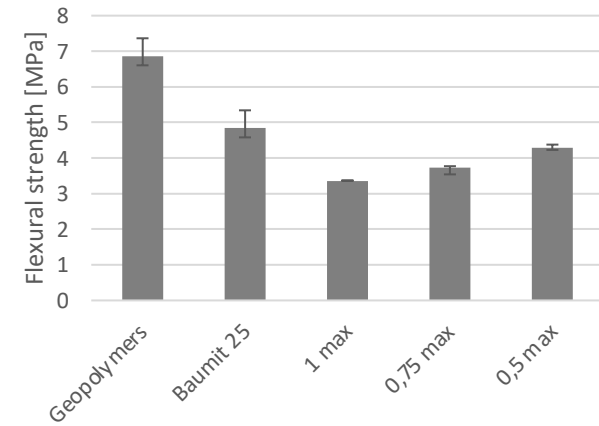


Density of geopolymer depending on the amount of fly ash in different places of its production

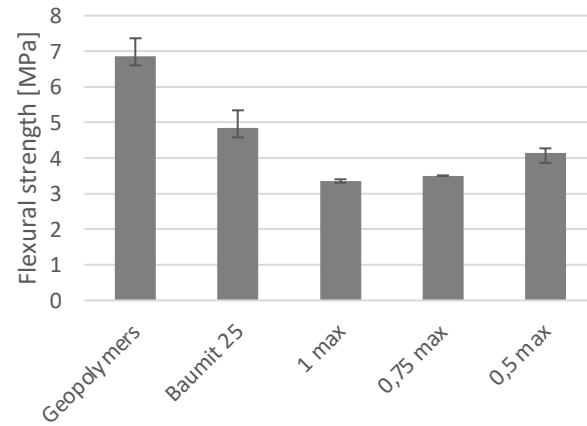


Flexural strength of the geopolymers using fly ash from thermal power plants

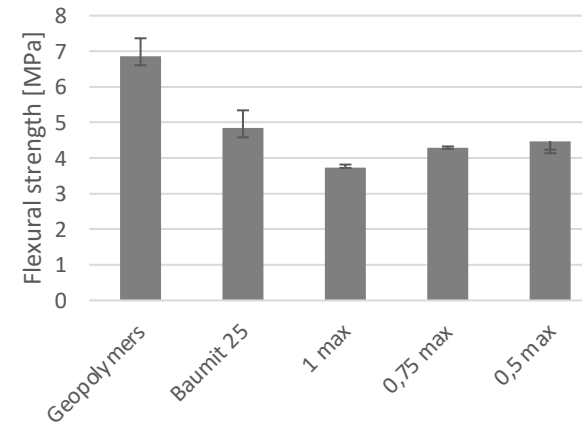
Otín (5)



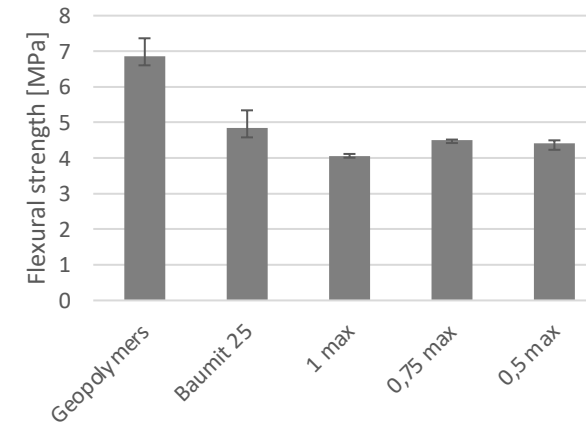
Trhové Sviny (7)



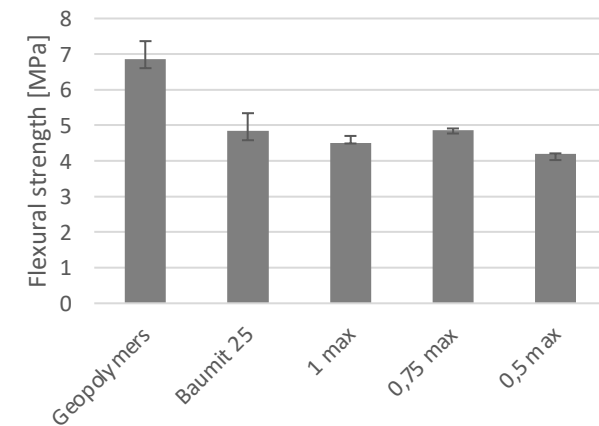
Mýdlový (6)



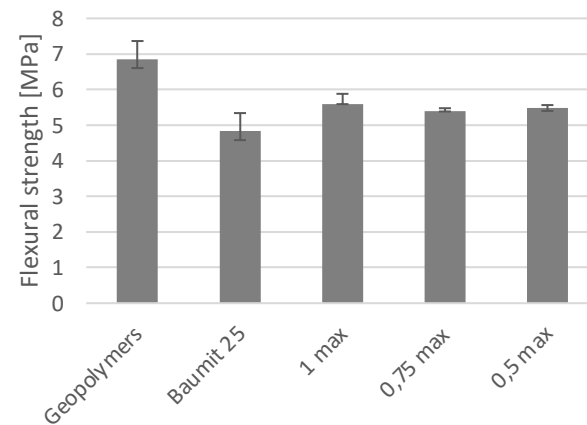
Písek (4)



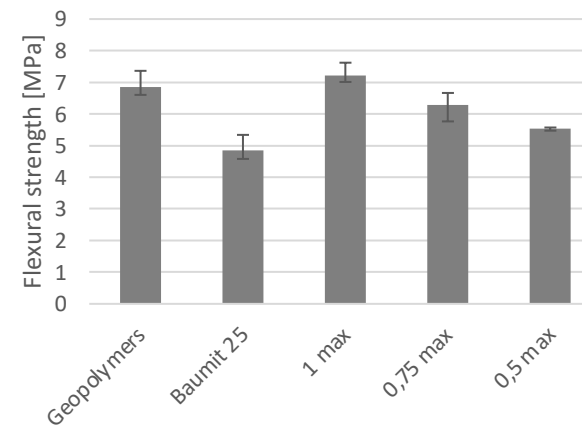
Český Krumlov (3)



Loučovice 615°C (2)



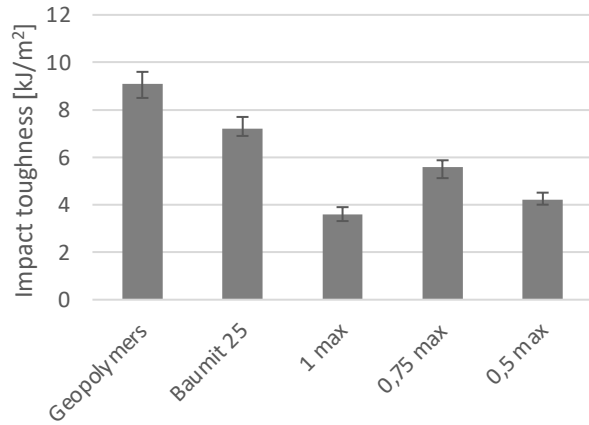
Loučovice 835°C (1)



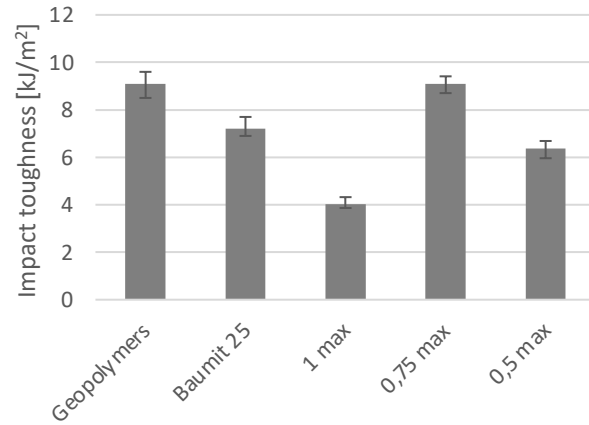
Baunit 25: concrete sample

Impact strength of samples

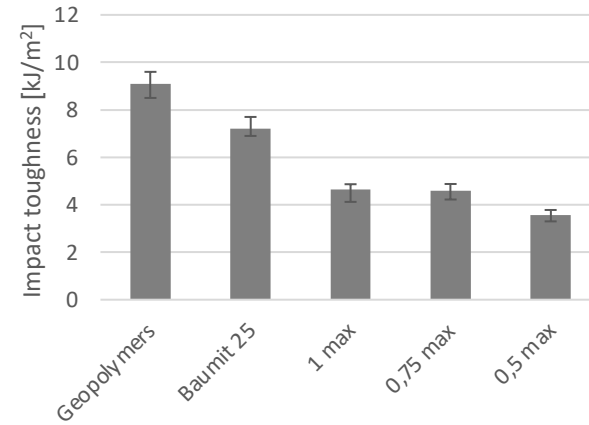
Otín (5)



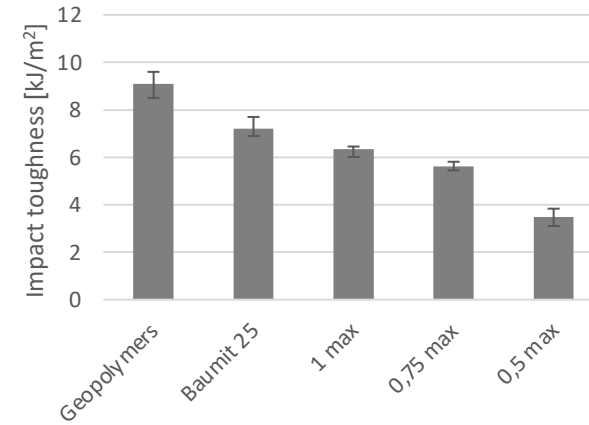
Mýdlový (6)



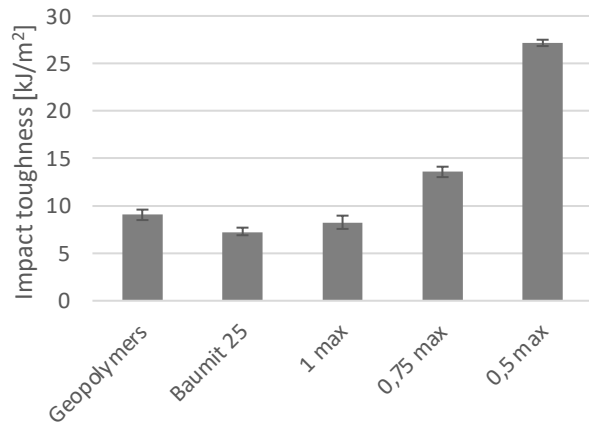
Písek (4)



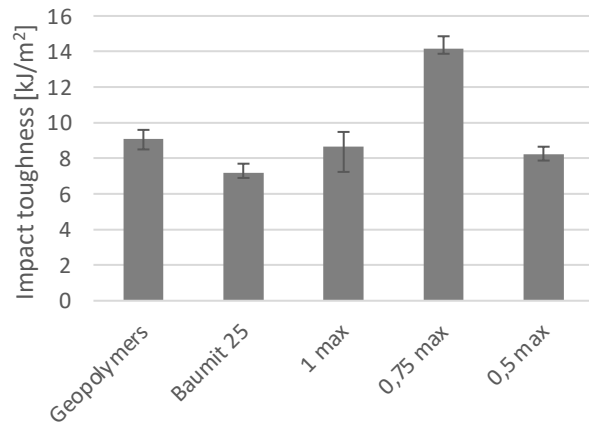
Trhové Sviny (7)



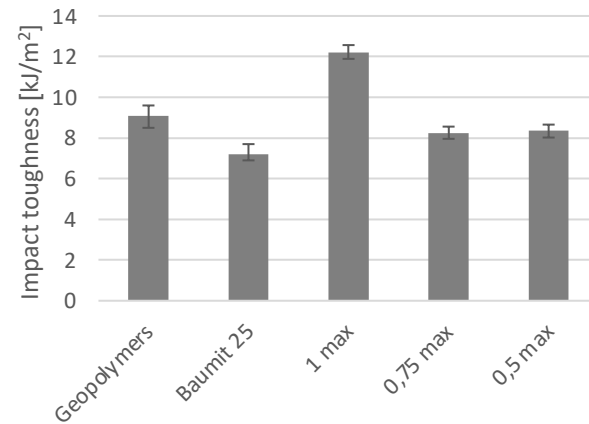
Loučovice 615°C (2)



Český Krumlov (3)

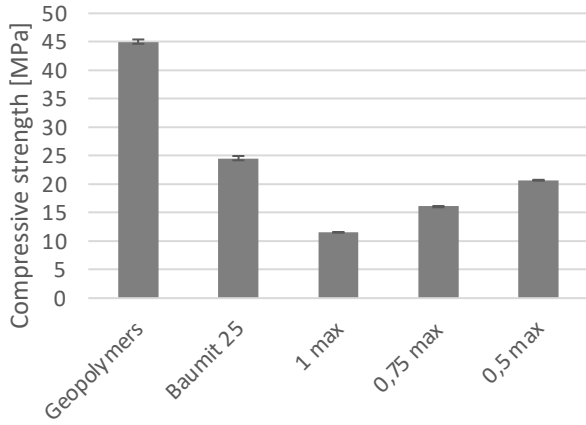


Loučovice 835°C (1)

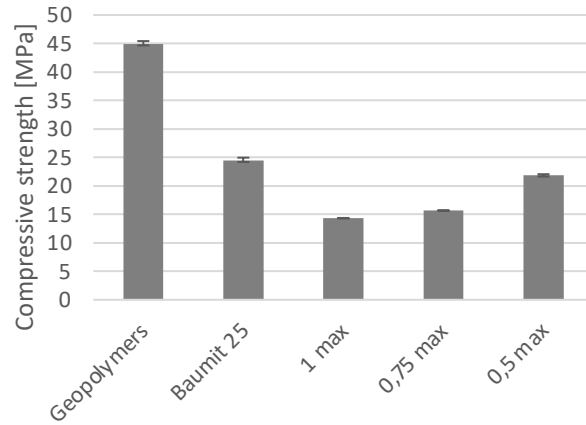


Compressive strength of samples

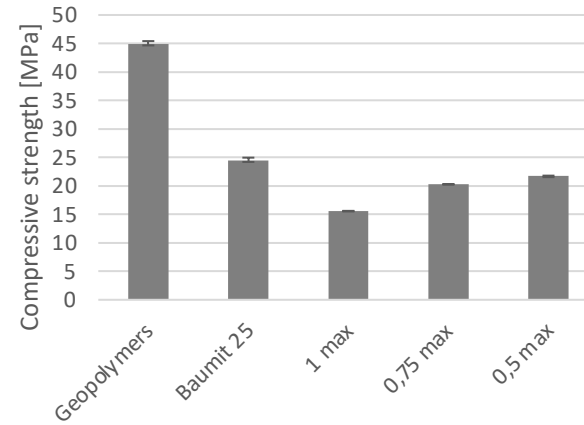
Otín (5)



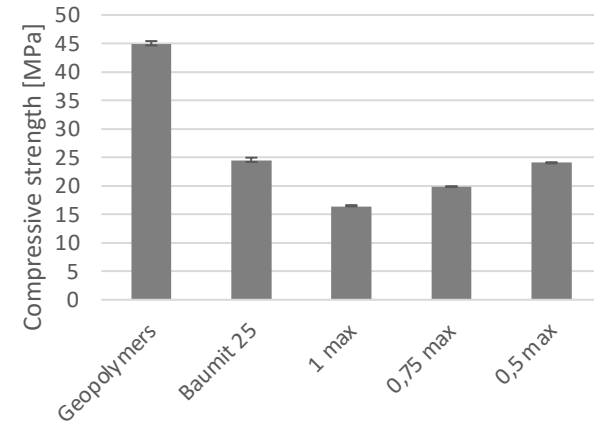
Trhové Sviny (7)



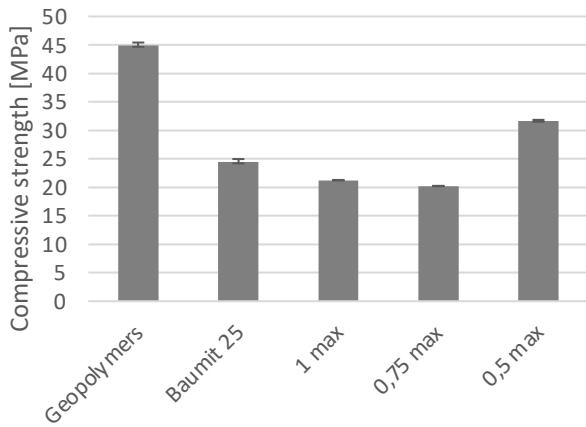
Písek (4)



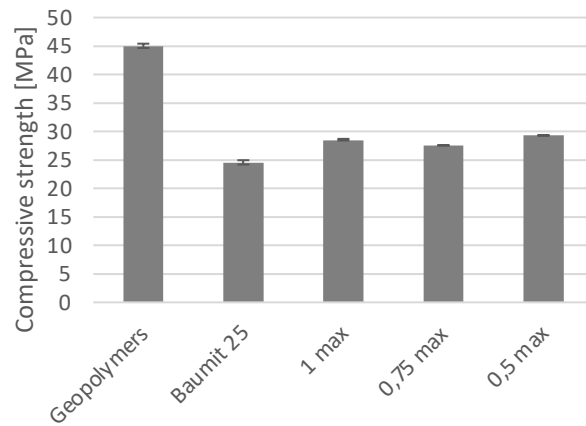
Český Krumlov (3)



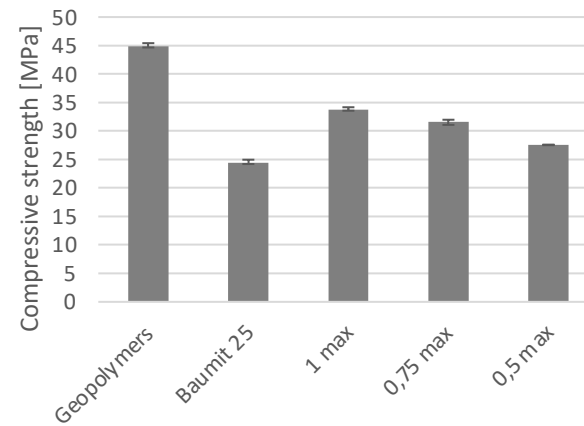
Mýdlový (6)



Loučovice 615°C (2)

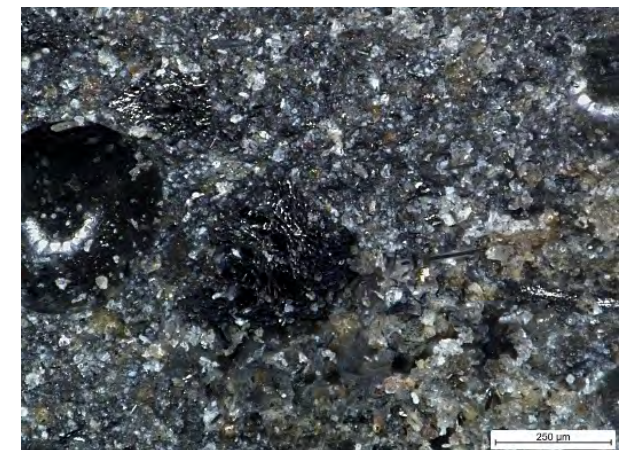
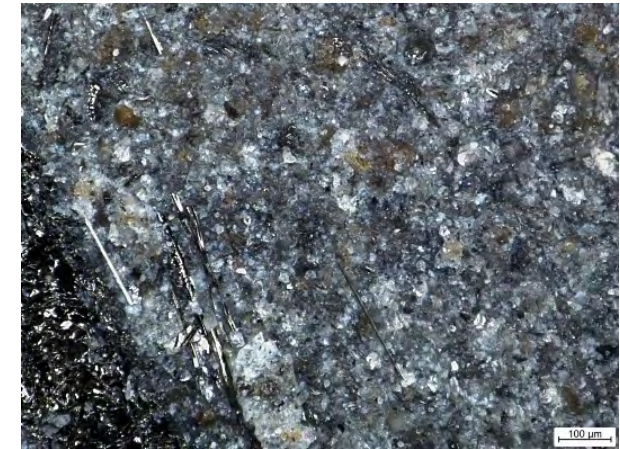


Loučovice 835°C (1)



Macroscopy of the surface of samples of geopolymer composites with high ash content

- on the left, a geopolymer composite without ash; 0.5max; 0.75max, on the right max - the scale size corresponds to 100 microns, and 250 microns, respectively



Conclusions

- Experimental and quantitative confirmation of the influence of fly ash chemical composition and microstructure on the physical and mechanical properties of geopolymers was obtained.
- A change in chemical composition and combustion temperature has been found to affect the change in mechanical properties of geopolymers.

Thanks for your attention

The team of the laboratory of geopolymers
of the Technical University in Liberec