Geopolymer-based on biomass bottom ash with addition of different slags

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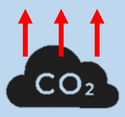
Introduction

Manufacture of Portland cement



Recent research line

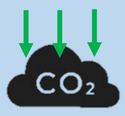
Alkali-activated materials
Geopolymers

based on

Activator
&
Precursor

- Natural minerals
- Waste
- Industrial by-product

achieving



Manufacture of pastes

Precursors

	SiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	SO_3	LOI
BBA	46.10	12.04	4.78	0.09	3.71	19.65	0.78	4.59	0.41	5.58
BSS	17.29	10.71	24.16	5.68	2.63	30.89	0.16	0.03	0.28	5.39
FSS	38.92	13.53	0.81	10.31	4.74	26.22	0.39	1.28	2.20	0
CS	27.65	2.04	62.18	0.03	0.38	1.25	0.63	0.56	0.90	0

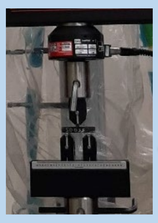
BBA: Bottom biomass ash
BSS: Black steel slag
FSS: Ferrosilicon slag
CS: Copper slag

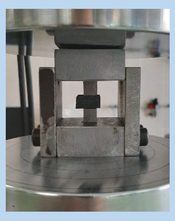
Activators

Code	Potassium Silicate	KOH (8M)	Ms
35-65	35%	65%	0.53
50-50	50%	50%	0.89
65-35	65%	35%	1.38
75-25	75%	25%	1.84

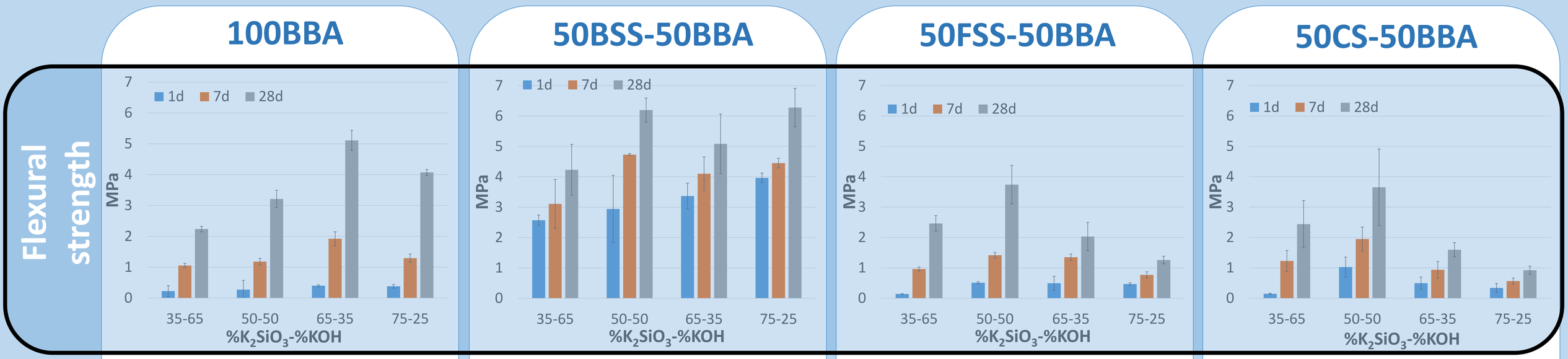
Curing
20ºC – 90% RH

1, 7 and 28 days



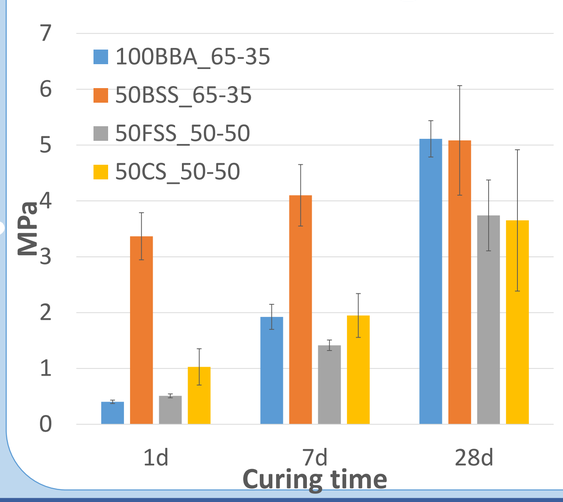


RESULTS

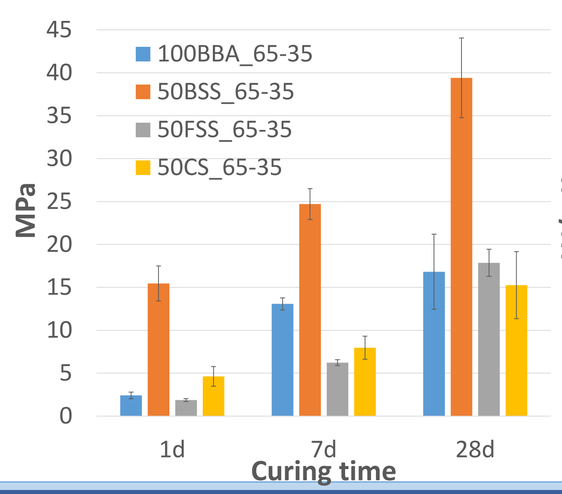


Best samples

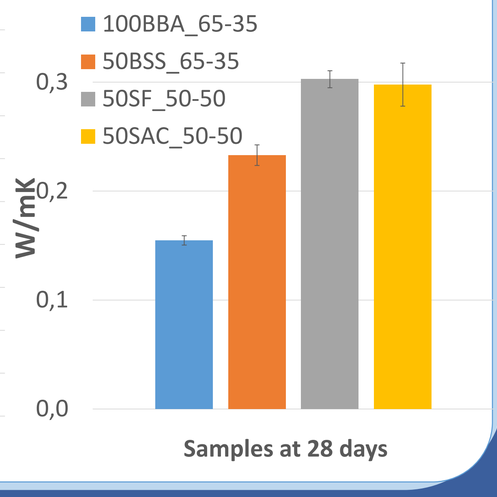
Flexural strength



Compressive strength



Thermal conductivity



Conclusions

· The results show that adding slag to cement-based on bottom ash, mechanical properties were improved or they were kept.

· Each specimen found its optimal Ms modulus. Although the most repeated were:

- 50 % wt K_2SiO_3 + 50 % wt KOH (8M) => Ms = 0.89
- 65 % wt K_2SiO_3 + 35 % wt KOH (8M) => Ms = 1.38

· Thermal conductivity increased when slag was added.

· The best paste was using BSS as precursor material and Ms module of 1.38.

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