SYNTHESIS OF SODIUM WATERGLASS FROM SPENT DIATOMACEOUS EARTH AS AN ACTIVATOR TO PRODUCE COPPER SLAG ALKALI-ACTIVATED CEMENTS.

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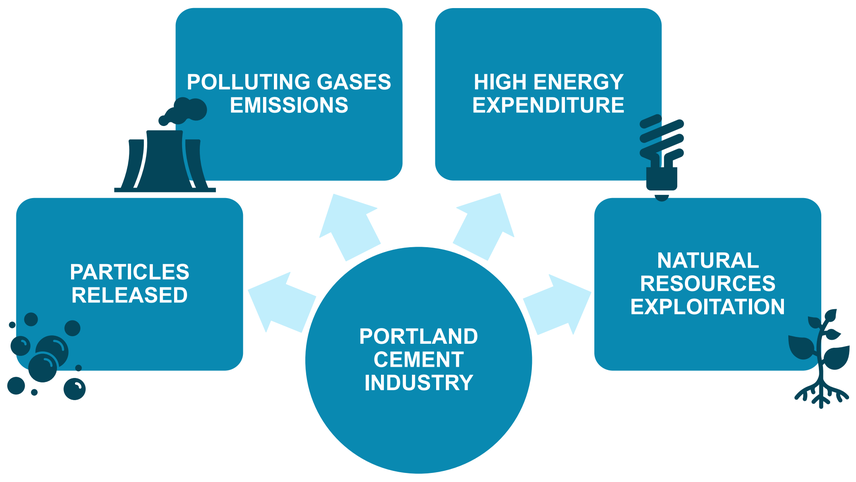
INTRODUCTION



ALKALI ACTIVATED CEMENTS

ENVIRONMENTALY FRIENDLY MATERIAL → ALTERNATIVE TO REPLACE PC

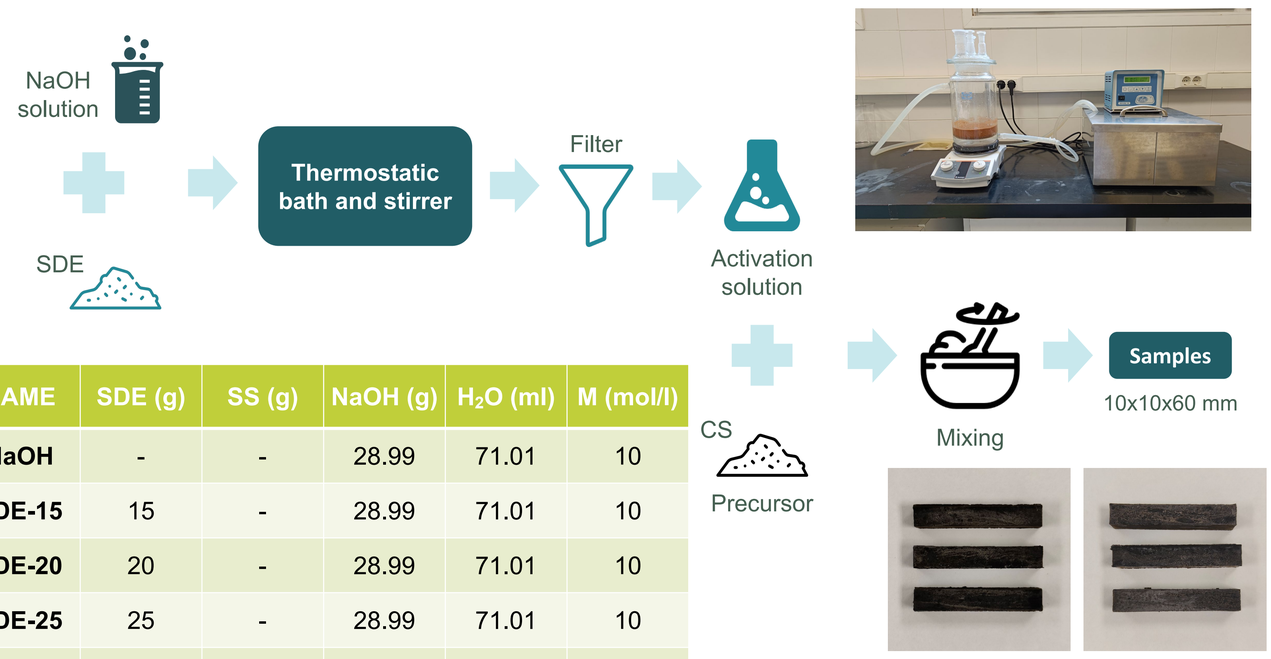
PRECURSOR: Aluminosilicate (SiO_2, Al_2O_3 and CaO) + ALKALI ACTIVATOR → Mixing → CHEMICAL REACTION → Setting and hardening → ALKALI ACTIVATED CEMENT

COMMERCIAL ALKALI ACTIVATORS → OBTAINED THROUGH QUITE EXPENSIVE AND HIGHLY POLLUTING PROCESSES

OBJETIVES

The purpose of this work was to investigate the possibility to synthesize sodium waterglass from spent diatomaceous earth (SDE) and used it as an activator to produce copper slag (CS) based alkali-activated cements.

MATERIALS AND METHODS

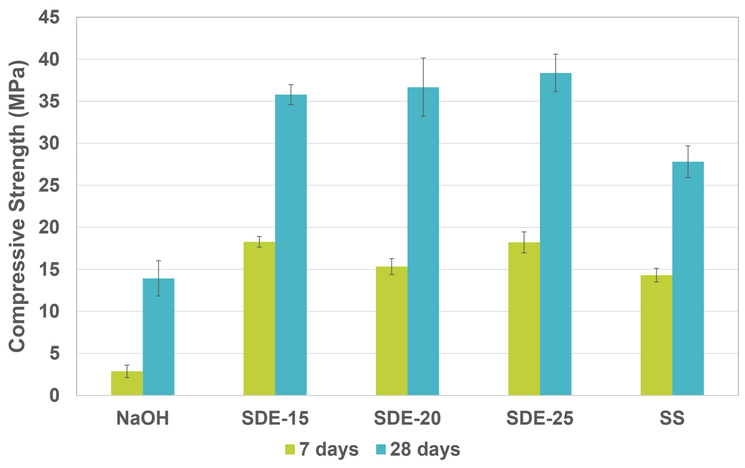


NAME	SDE (g)	SS (g)	NaOH (g)	H_2O (ml)	M (mol/l)
NaOH	-	-	28.99	71.01	10
SDE-15	15	-	28.99	71.01	10
SDE-20	20	-	28.99	71.01	10
SDE-25	25	-	28.99	71.01	10
SS	-	100	28.99	71.01	10

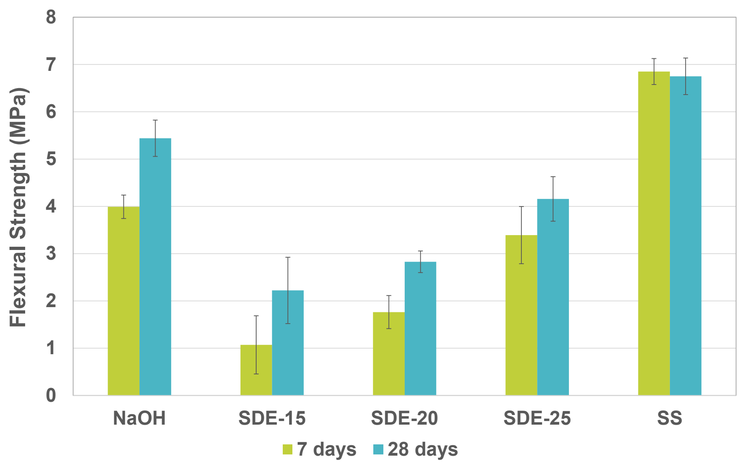
Three different activation solutions were prepared by mixing sodium hydroxide with various amounts of spent diatomaceous earth (SDE). Besides, sodium hydroxide solution and NaOH solution were used as alkaline activator for control specimens. The solid/water ratio was set to 0.4

RESULTS AND DISCUSSION

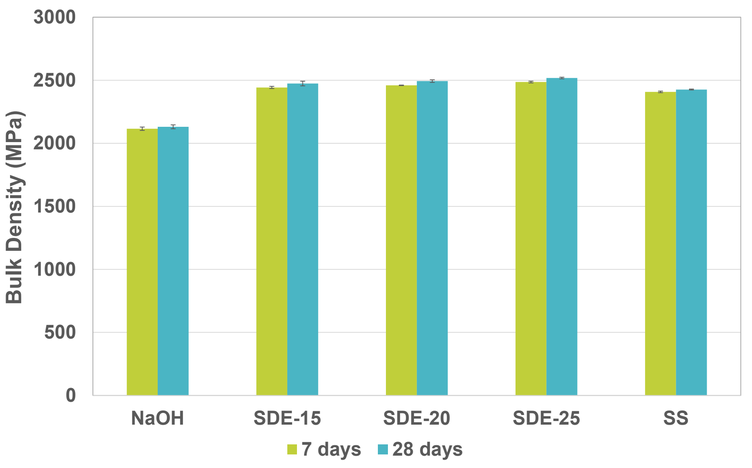
COMPRESSIVE STRENGTH



FLEXURAL STRENGTH



BULK DENSITY



Results showed that materials activated with spent diatomaceous earth reached higher compressive strength and similar bulk density than those activated with commercial sodium silicate. Best results were obtained by specimens with 25g of spent diatomaceous earth for every 100 ml of sodium hydroxide solution.

CONCLUSION

The study confirms the possibility of using spent diatomaceous earth as an alternative activator in the production of alkali-activated cements. In order to obtain binders with an almost zero carbon footprint and to mover towards circular economy, it is necessary to replace commercial activators by alternative activators obtained from waste. This study demonstrates that more economically and environmentally sustainable technology can be used to produce waterglass, reducing the environmental impact of alkaline activation materials.

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AGENCIA ESTATAL DE INVESTIGACIÓN

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