

## FOUNDRY SAND ALKALI ACTIVATION FOR SUSTAINABLE CONSTRUCTION

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The study presented was developed in the frame of the project *New recycling processes for the foundry sands: innovation aimed to get materials with high-added value*, funded by Fondazione Cariplo.

The project's overall objective of the project has been to identify processes for recycling foundry sand from cast iron into high-value-added materials in order to facilitate the creation of an effective market for this sand and to overcome the current economic and legal barriers to its development. In this research project, foundry sands are used as secondary aluminosilicate precursors in the production of alkali-activated materials at room temperature, promoting a reduction in the amount of quarry sand currently required by the industries.

Characterization of foundry sand was performed in terms of chemical composition, particle size distribution, mineralogical analysis, and morphological and microstructural characterization. Alkali-activated formulations were produced, with different ratios of Si/Al (1-3) and Na/Al (1), replacing various percentages of metakaolin with foundry sand, and evaluating the influence of the variation of the quantity of activating solution (NaOH and  $\text{Na}_2\text{SiO}_3$ ). An experimental design was set up to determine the influence of different parameters, not only the metakaolin content but also the volume of the two solutions used, namely  $\text{Na}_2\text{SiO}_3$  and  $\text{NaAlO}_2$ , varied from 20 to 40 ml (Fig.1).

Factors			
	% MK	NaOH	$\text{Na}_2\text{SiO}_3$
Levels	30%	20	20
	50%	30	30
	70%	40	40

  

	% MK	NaOH	$\text{Na}_2\text{SiO}_3$
1	30%	20	20
2	30%	30	30
3	30%	40	40
4	50%	20	30
5	50%	30	40
6	50%	40	20
7	70%	20	40
8	70%	30	20
9	70%	40	30

Figure 1 Design of experiments composition

Samples were characterized to evaluate chemical stability through pH and ionic conductivity measurements, integrity in water, and compressive strength. Samples with 30% replacement of MK with foundry sand resulted in acceptable chemical stability and mechanical strength values.