

# Studying Geopolymer as an eco-friendly material in the restoration of mural paintings

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## INTRODUCTION & AIM

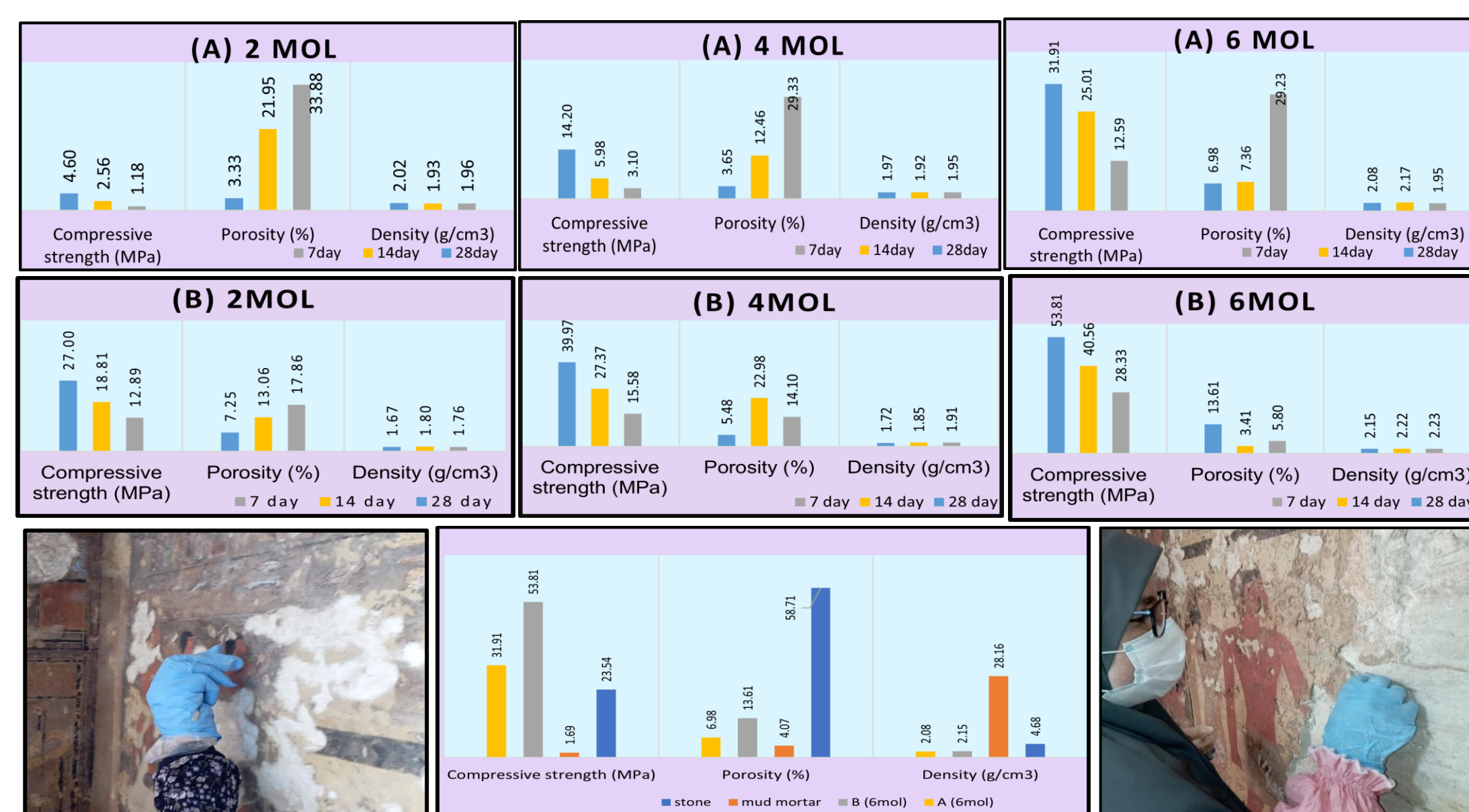
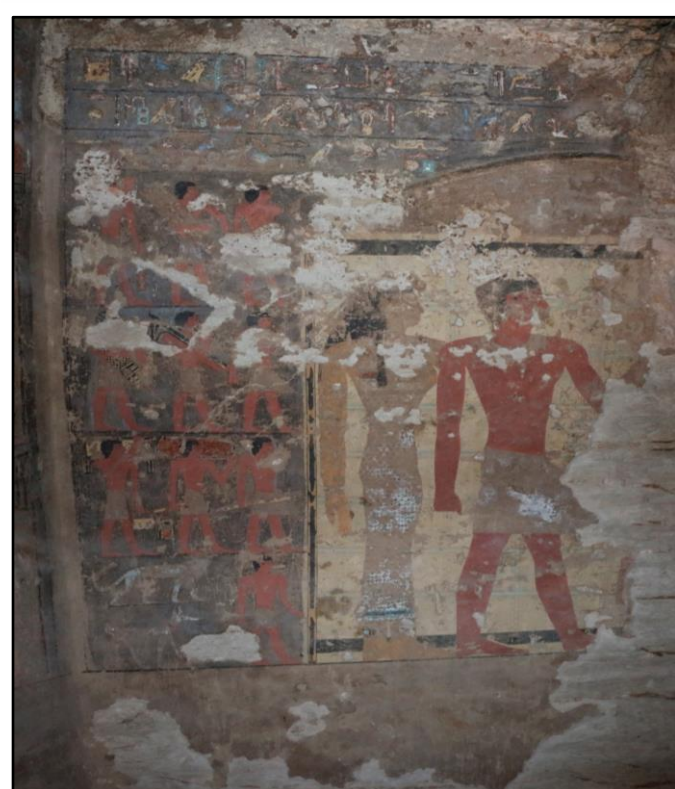
The study handling the application of geopolymers, as an eco-friendly, green binder, Cheaper , easy to Use and prepare compatible with the mural painting layers (stone - mortars), good properties and resistance to corrosion, which achieves sustainability of the applied restoration materials .

The experimental study provided mixtures of geopolymers, as an alternative mortar and employed them according to the needs of restoration operations (blocks, mortars, adhesives) on mural paintings in the tombs of Nfr sSm ptH and Sxntiw (5 dynasty) in Saqqara necropolis.

## METHOD

The study introduces components of two geopolymer mixtures of metakaolin (MK) , fly ash(FL), limestone powder (LP), natural hydraulic lime (NHL-5), sand (S) , distilled water and sodium hydroxide (NaOH) used as an activating agent in three molarities (6,4,2 mol). The mixture tested in many ages (1-2- 4) weeks.

MIXTURE	MK %	FL%	LP%	NHL%	S%
MIXTURE ( A)	15	15	20	-	50
MIXTURE (B)	15	20	-	15	50



## RESULTS & DISCUSSION

The results of the selected geopolymer mixtures A,B Recorded density ranging from 2.17:2.15 g/cm<sup>3</sup>,porosity 6.98 :3.61%, and compressive strength 31.91 : 53.81 MPa, which is equivalent to 2.3 times the compressive strength of mother rock and exceeds the ancient mortar by 31.1 times. Therefore, there is more than one factor enhance the properties of the geopolymer mixture. The most important factors were the molarity, the addition of 15:20% of the components of the mixture MK , FL and 15:20% CaO specially in the form of NHL .

## CONCLUSION

Geopolymers mixtures with 6 Mol have achieved the best properties, which confirms the possibility of successfully applying geopolymers in complete missing parts of plaster and blocks , injection cracks .

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