WHEN GREEN CONCRETE MEETS FIRE

Aqsa Memon
Faculty of Civil Engineering, TU Dresden I aqsa.memon@mailbox.tu-dresden.de

INTRODUCTION

The production of cement globally contributes around 5-8% of the CO_2. Limestone calcined clay cement (LC3), coupling of limestone and low-grade calcined clay to replace clinker, shows great potential as a viable alternative to OPC. It has significant potential to reduce carbon dioxide emissions from the cement industry.

THE ROLE OF CALCINED CLAY

Clay is used here in cement as suplementary cementitious material because clays are abundant materials worldwide

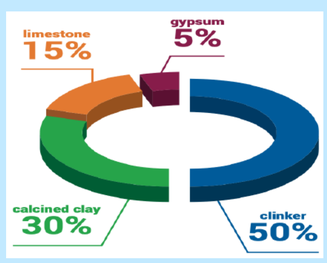
Calcined to 800°C

THE ROLE OF LIMESTONE

Limestone is also commonly added to cement. It enhances the properties of cement.

RECIPE OF LC3 CONCRETE

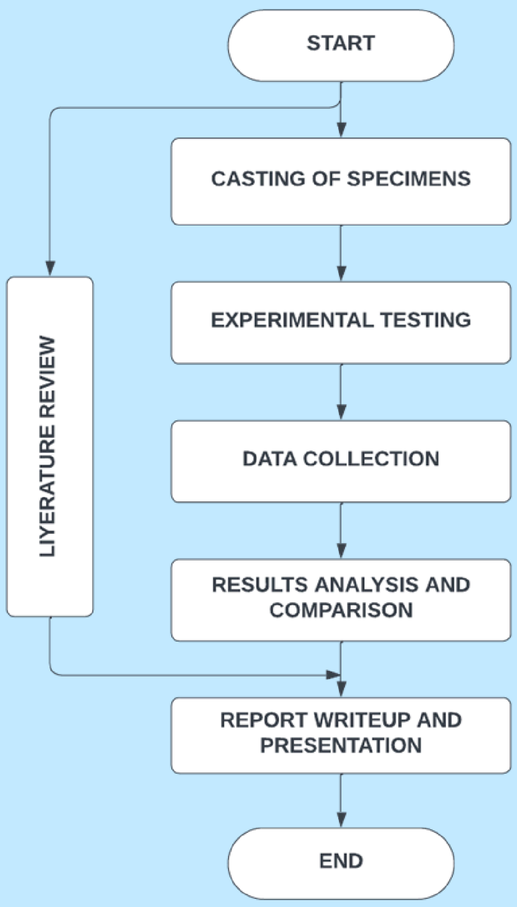
Limestone calcined clay cement (LC3) is formed with mixing the clinker(50%), calcined clay (30%), limestone (15%), and gypsum (5%) .



OBJECTIVES

To access the mechanical and durable properties of OPC and LC3 concrete exposed to temperatures up to 1000°C.

METHODOLOGY

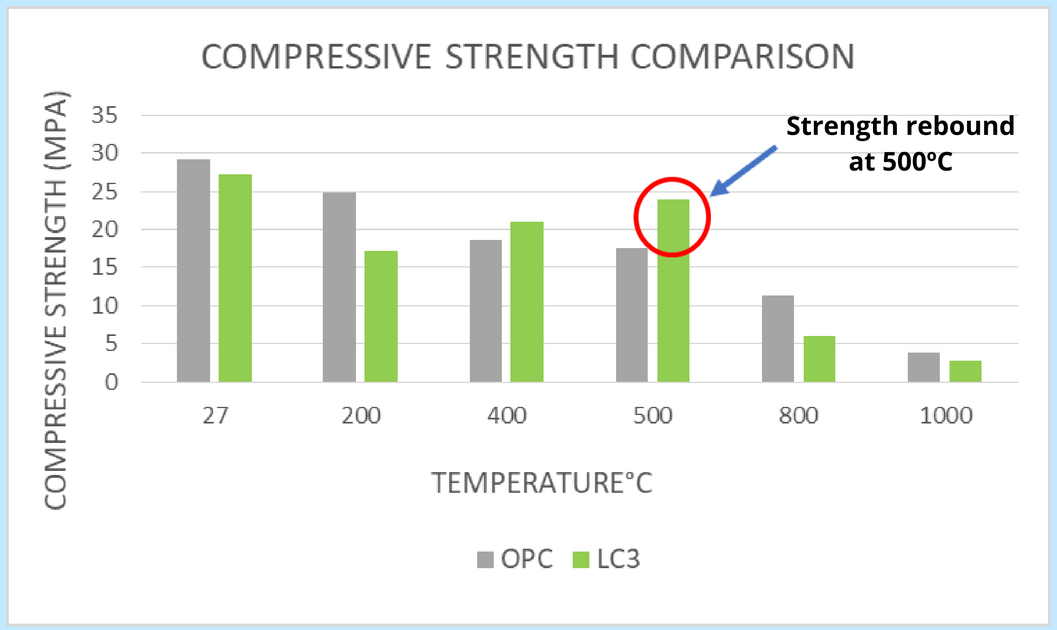


KEY RESULTS: MECHANICAL PERFORMANCE

COMPRESSIVE STRENGTH (OPC VS LC3)

LC3 and OPC cylinders were tested at different temperature intervals from room temperature to 1000°C using compression testing machine (CTM)

Cylinder placed in CTM



Results showed higher compressive strength of LC3 at 500°C compared to OPC.

TENSILE STRENGTH (OPC VS LC3)

LC3 and OPC cylinders were tested at different temperature intervals from room temperature to 1000°C using compression testing machine (CTM).

Cylinder placed in UTM

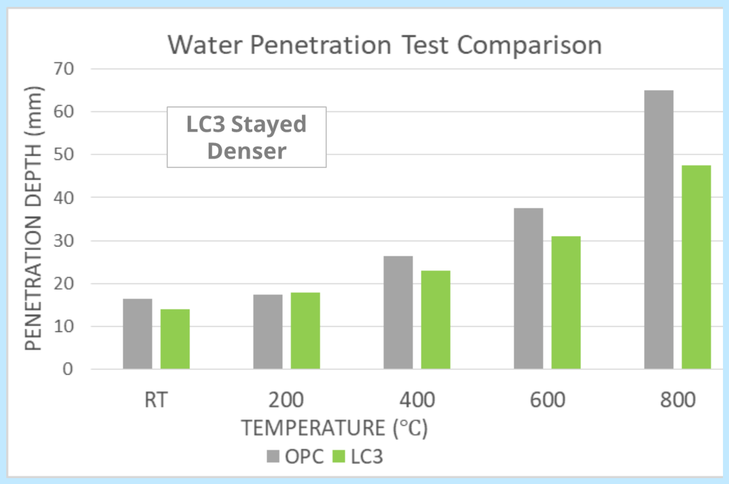
Results showed higher tensile strength of LC3 at 500°C compared to OPC.

KEY RESULTS: DURABLE PERFORMANCE

WATER PENETRATION DEPTH (OPC VS LC3)

Water penetration depth was tested for both LC3 and OPC cylinders at different temperature intervals from room temperature to 1000°C

Cylinder in water penetration chamber



LC3 showed higher lower water penetration depth at all temperatures compared to OPC.

CONCLUSIONS

1. **LC3 showed a significant strength recovery both in tensile and compressuve strength at 500°C, which distinguished it from OPC.**
2. **LC^3 showed less water penetration depth at all temperatures compared to OPC.**

FUTURE OUTLOOK

Conduct microstructural analysis like scanning electron microscopy (SEM) and X-ray diffraction (XRD) to understand changes at the microscopic level after high-temperature exposure.

REFERENCES

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- **Sheikh, M. D., Jamil, T., Ayub, T., Khan, A. U. R., Bilal, S. M., & Hu, C. (2023). Comparative Study on LC3-50 with OPC Concrete Using Raw Materials from Pakistan. Advances in Materials Science and Engineering, 2023.**