

**Dr. EYO E. U.** (PhD, MSc BEng)

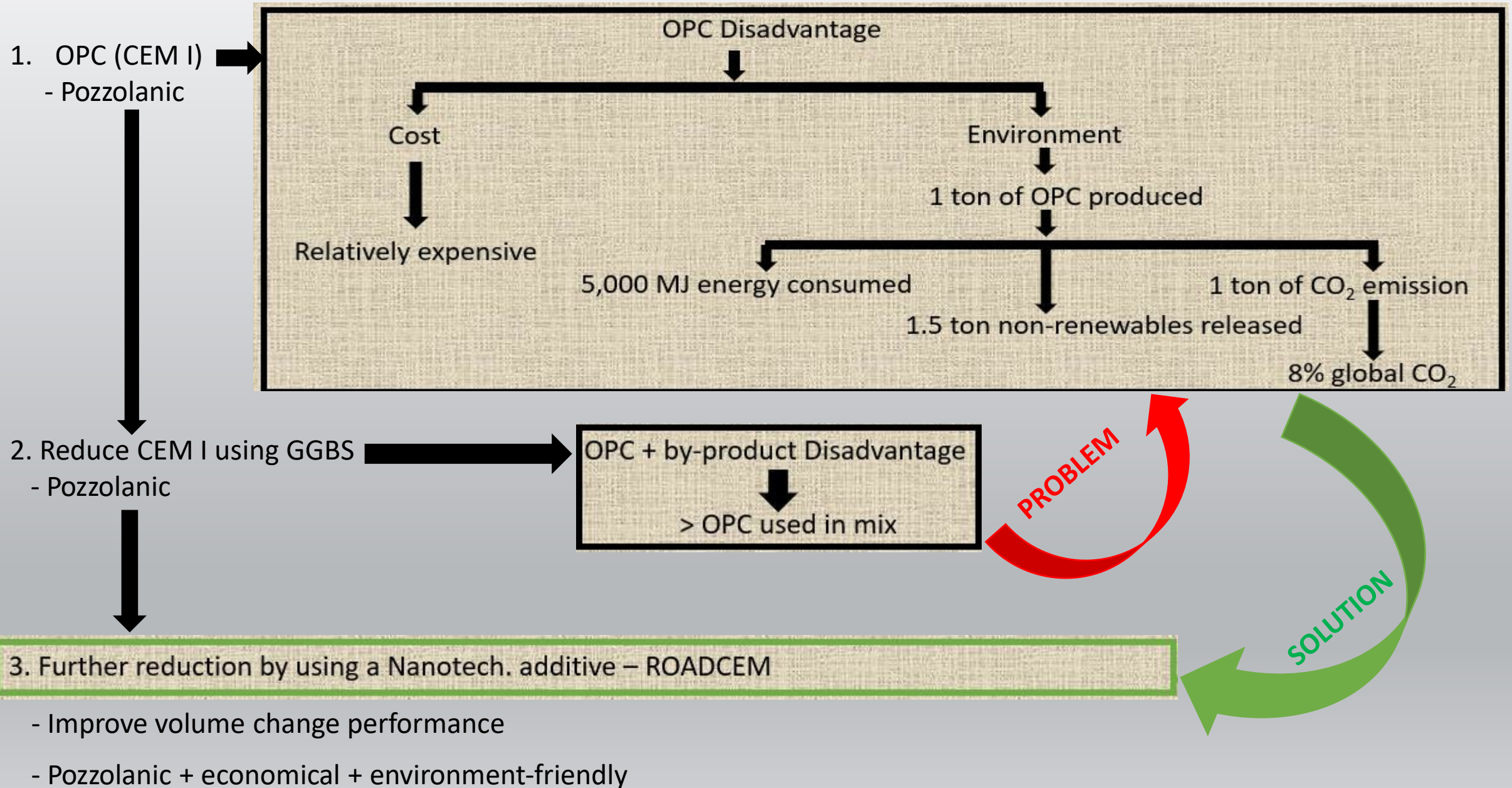
# **Title:**

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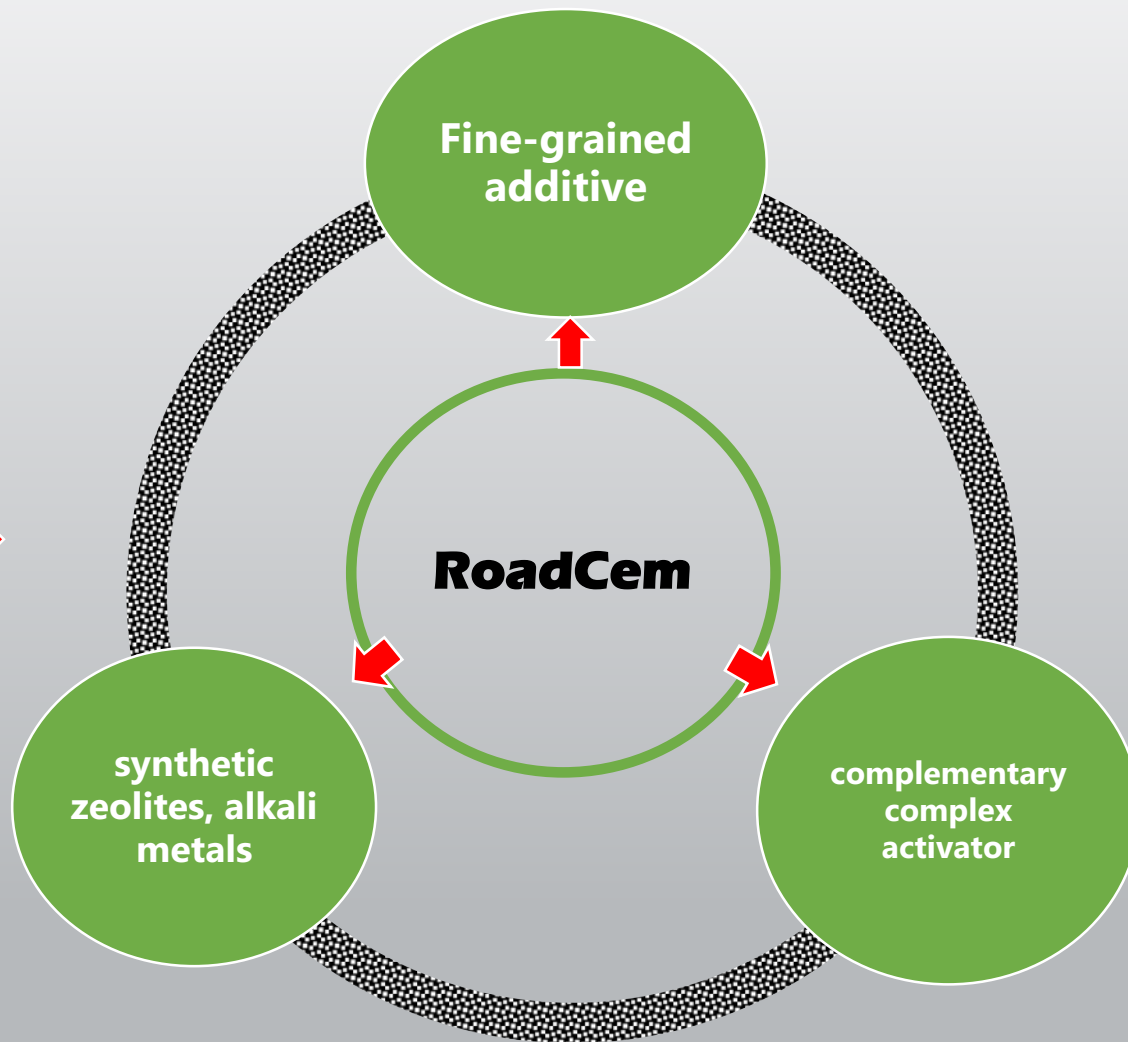
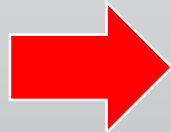
**Effect of Inclusion of RoadCem in an Expansive clay  
amended with cementitious binders**



# Research Question



# A Green Solution



## METHODOLOGY

### PHASE I

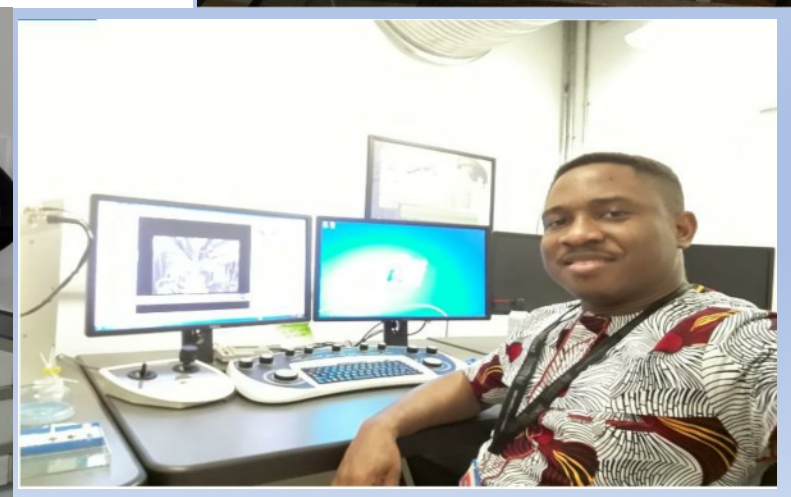
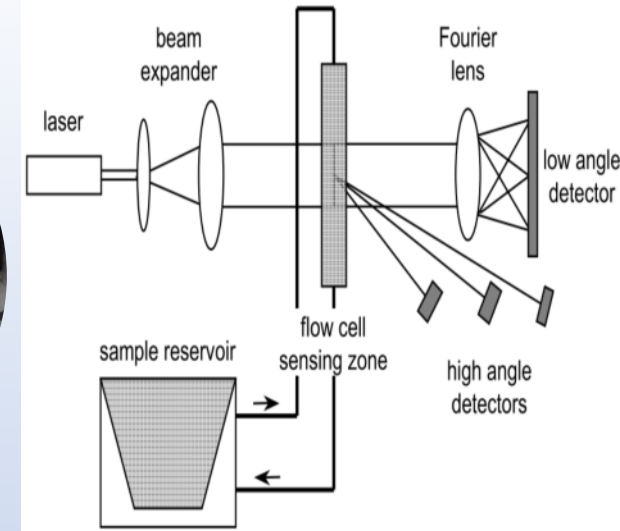
- Material sampling & selection:
  - Expansive and sulphate bearing clay
  - Binders
  - Soil & binder mix design
  - Soil & preparation

### PHASE II

- Engineering and Physical Property Testing:
  - Basic properties (size analysis, Atterberg limits, moisture content, specific gravity, compaction testing, etc)
  - Oedometer swelling and consolidation
  - Unconfined compression testing
  - Suction measurement

### PHASE III

- Microstructural features:
  - Scanning electron microscopy (SEM)
  - Energy dispersive spectroscopy
  - X-ray Diffractometry



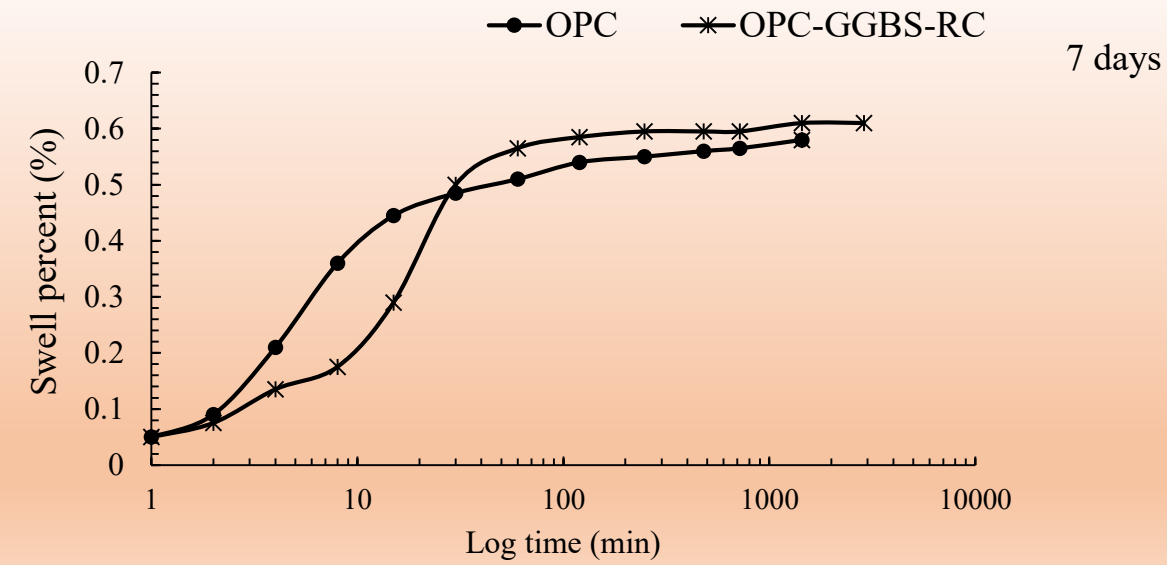
# Geotechnical properties

Property	Kaolinitic Soil
Plasticity index (%)	28
Swell percent (%)	12.6
Strength (kN/m <sup>3</sup> )	190
Compression index	0.109

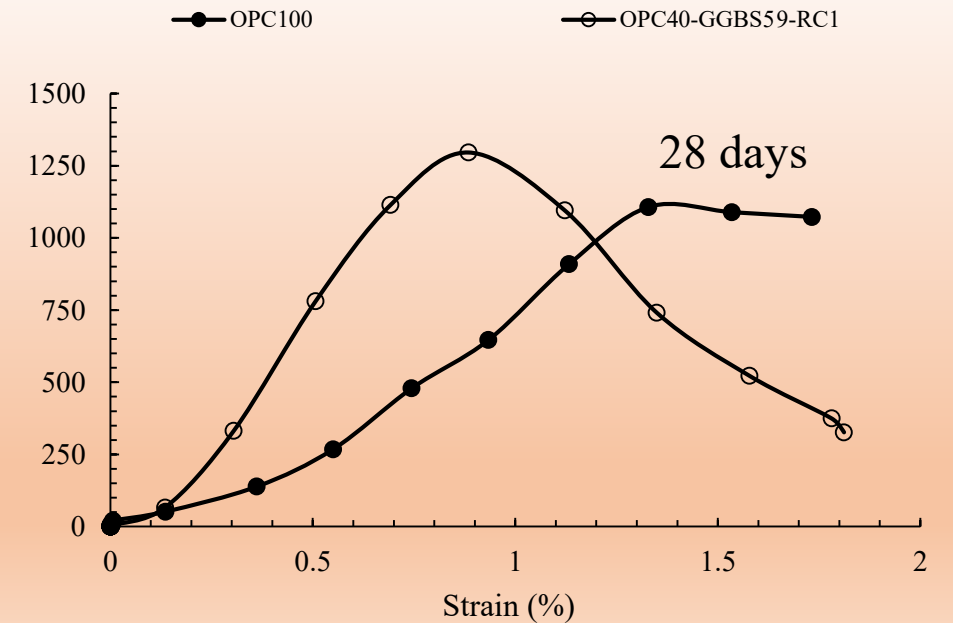
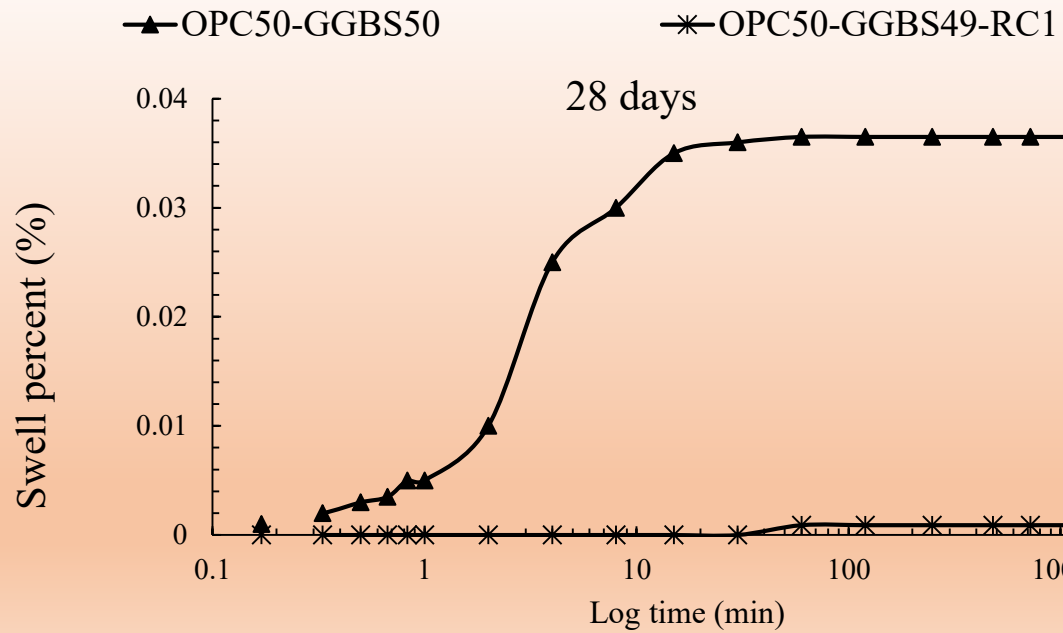
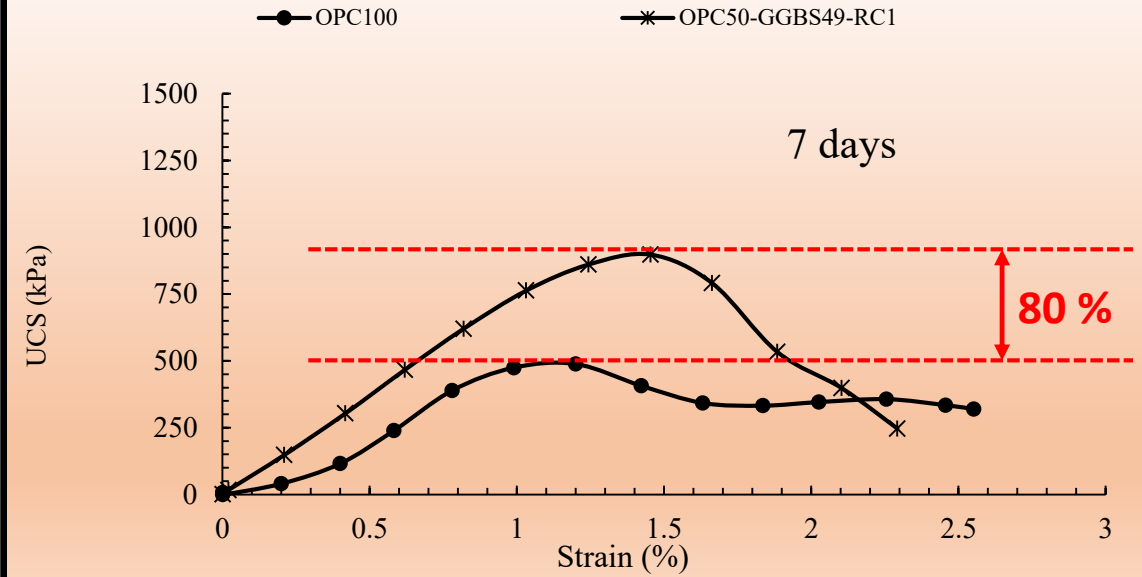
# Mix design

Mix proportion	Phase 1 mix	Phase 2 mix	Phase 3 mix
	% by dry wt. of OPC		
OPC	100	-	-
Notation	OPC100	-	-
OPC: GGBS	50:50	40:60	30:70
Notation	OPC50-GGBS50	OPC40-GGBS60	OPC30-GGBS70
OPC: GGBS: RC	50:49:1	40:59:1	30:69:1
Notation	OPC50-GGBS49-RC1	OPC40-GGBS59-RC1	OPC30-GGBS69-RC1

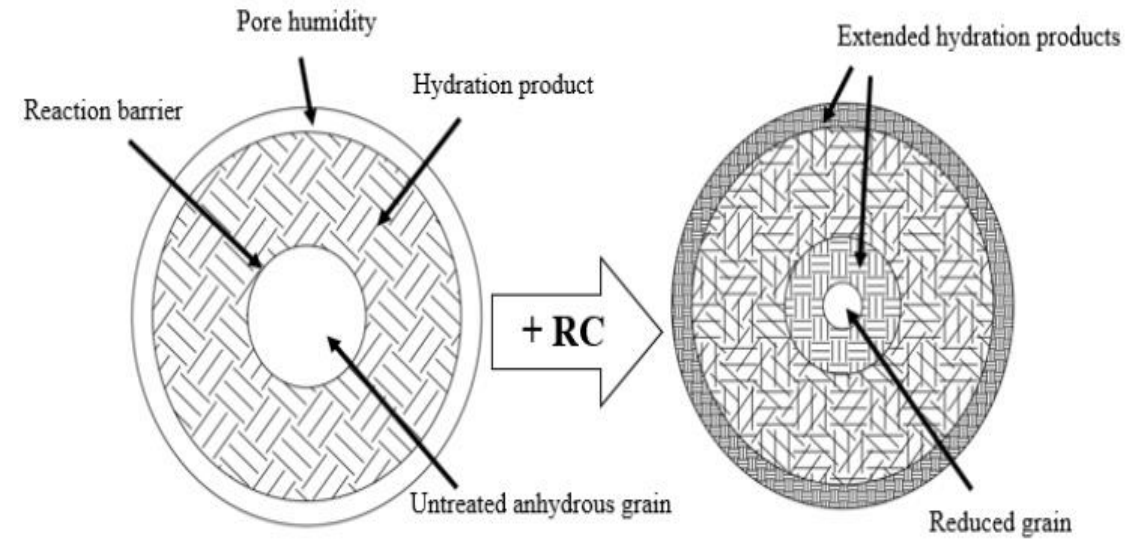
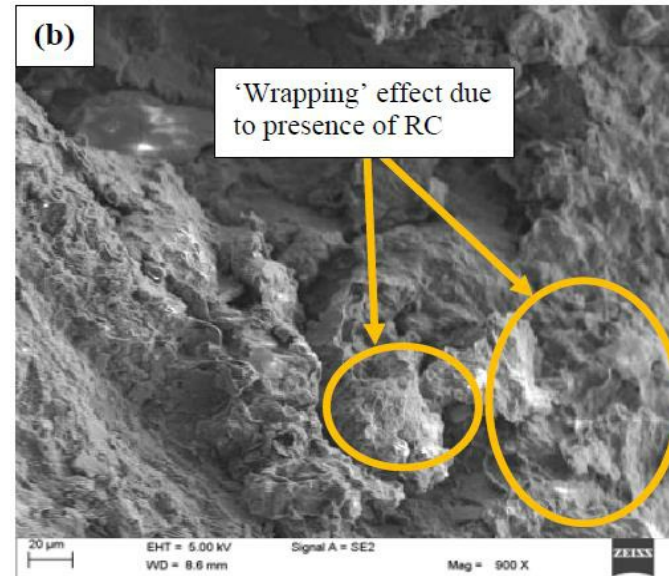
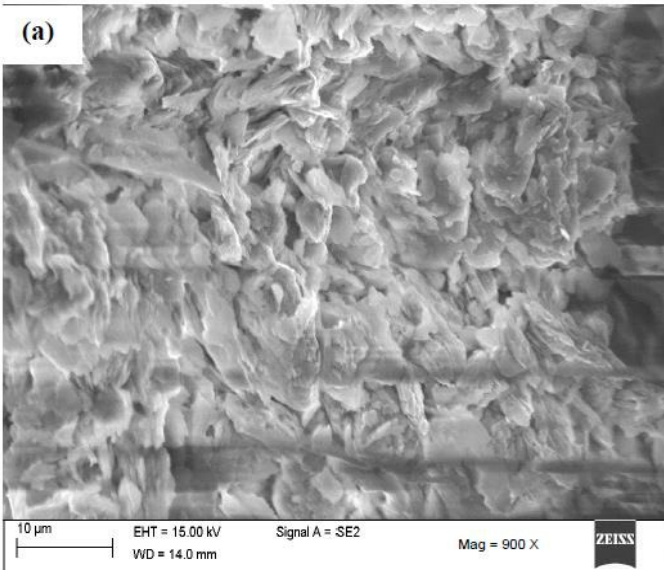
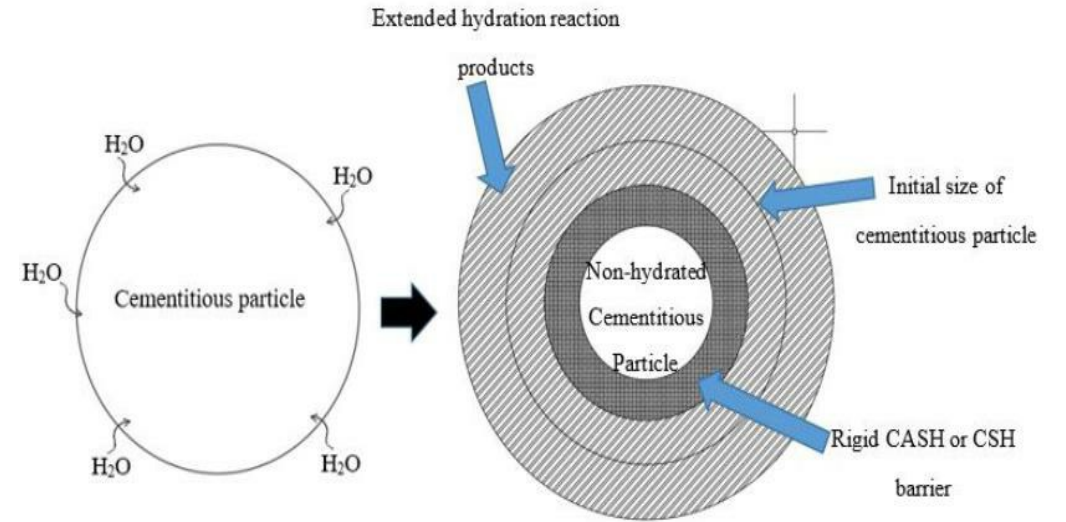
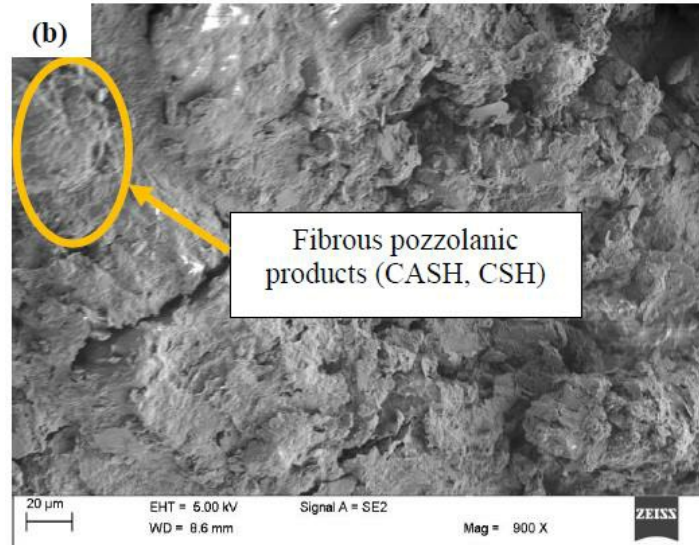
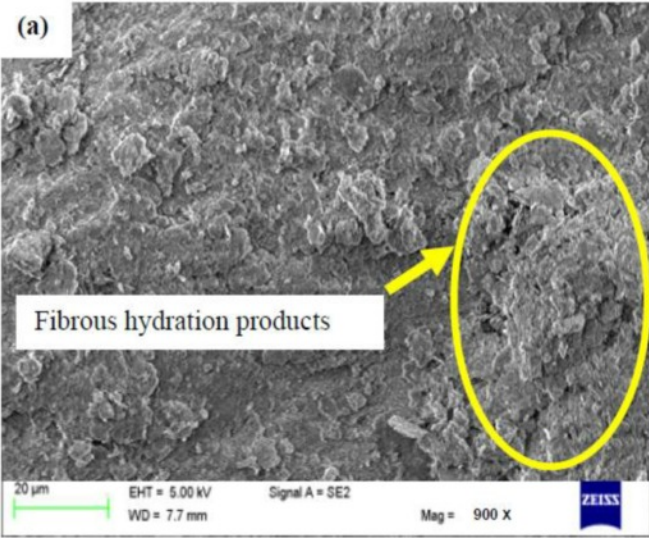
## Swell with RC Inclusion



## Strength with RC Inclusion

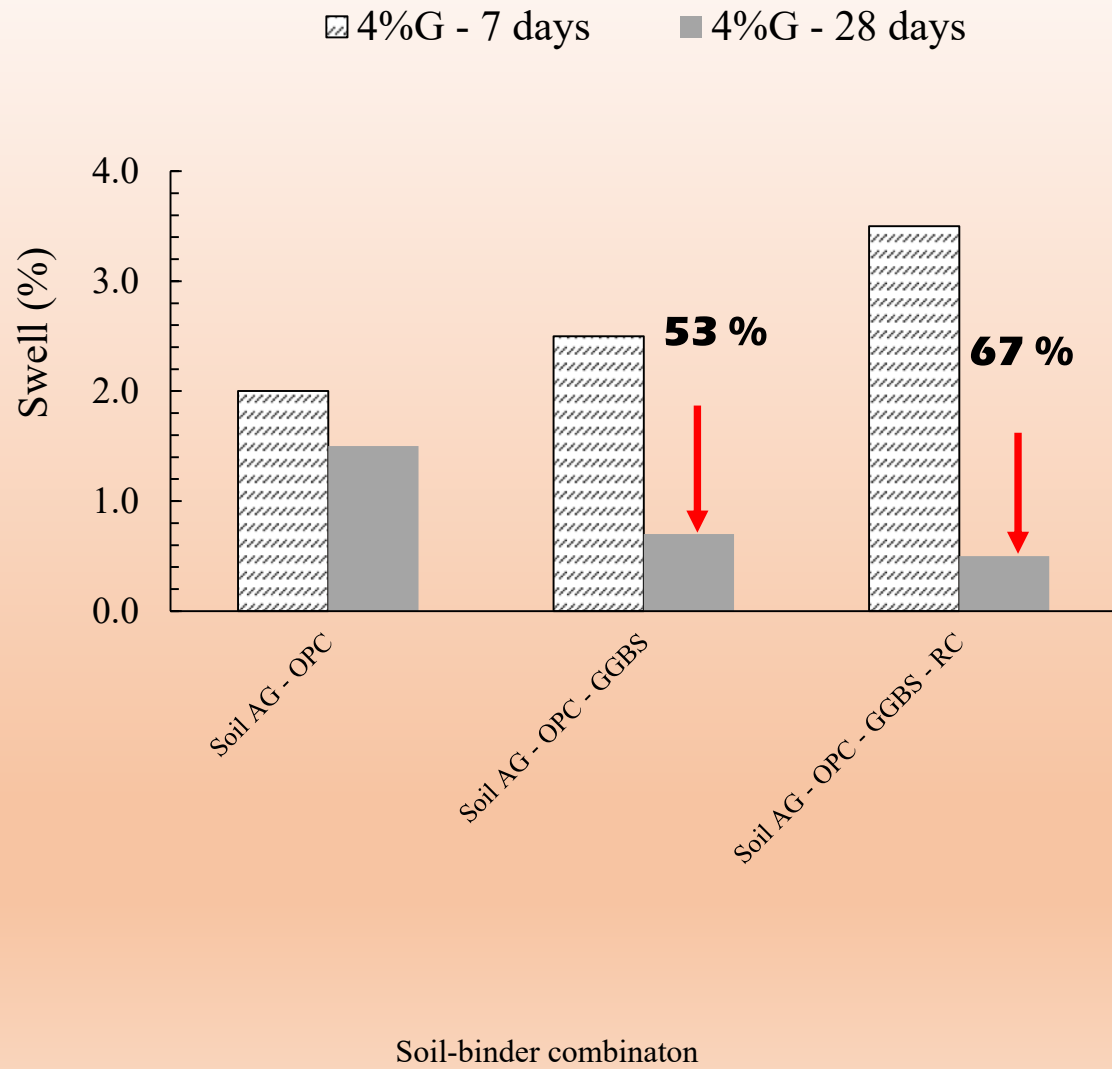


# Stabilised SOIL – Micro-mechanics features

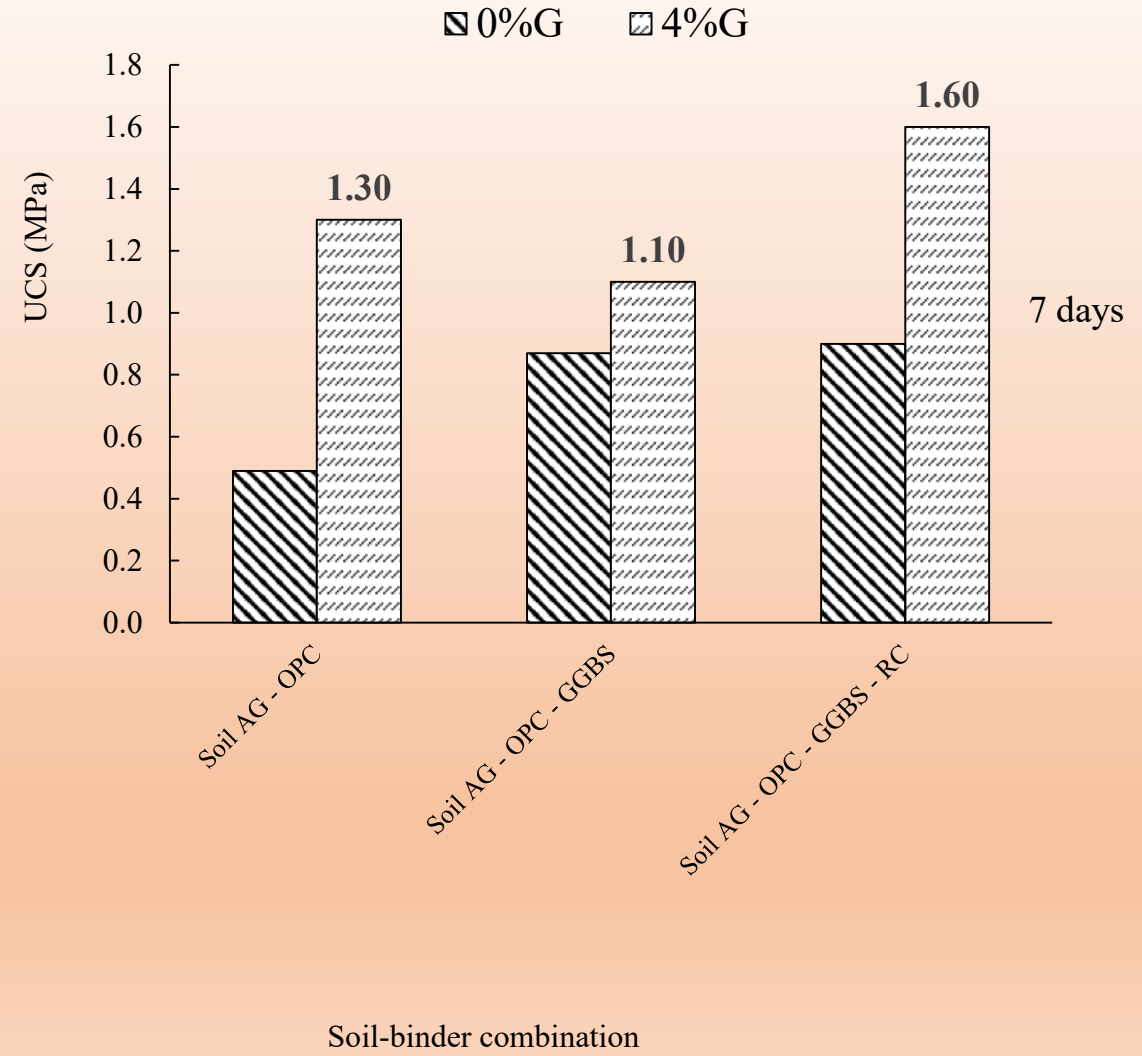




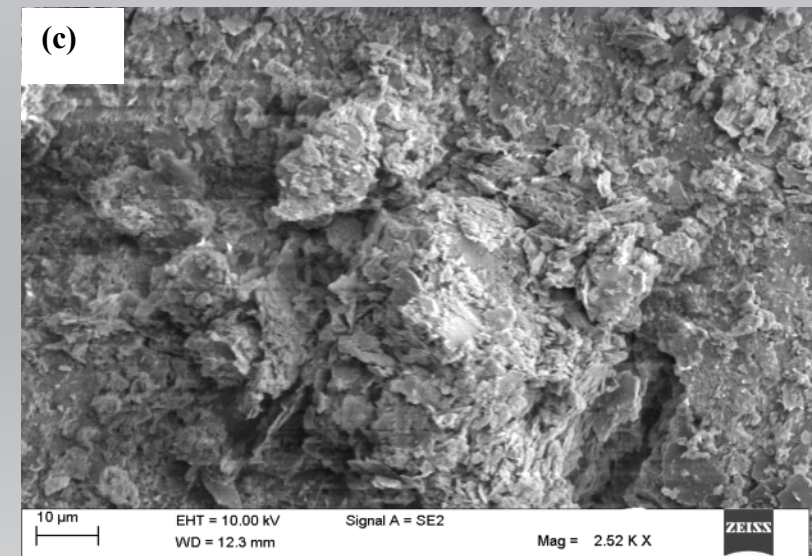
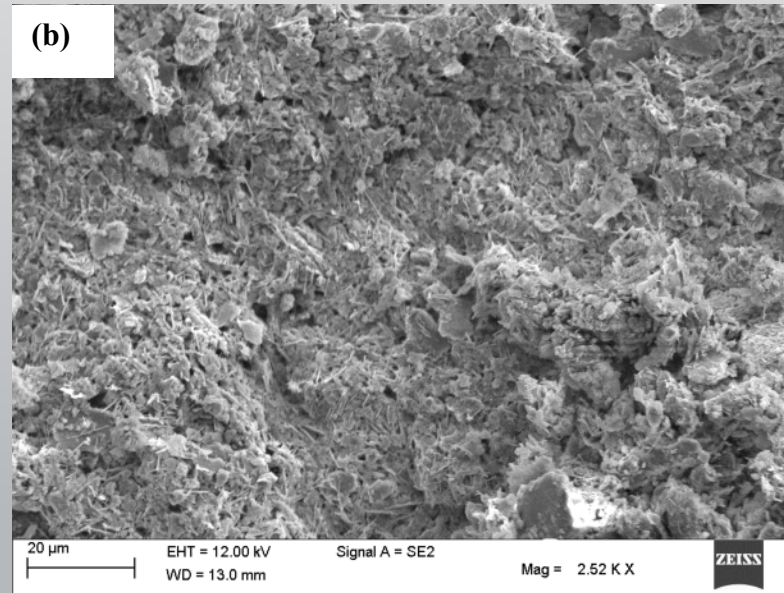
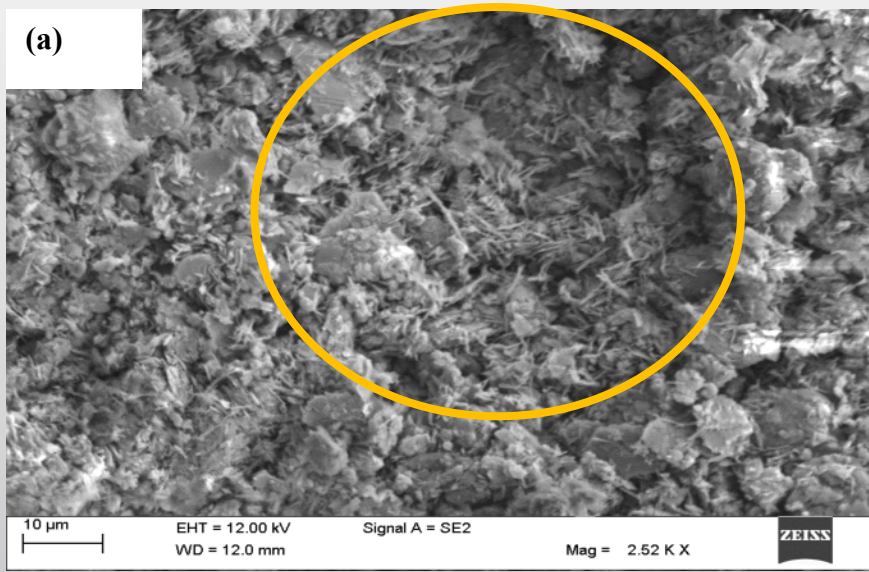
# Stabilised Sulphate soil – Swell



# Stabilised Sulphate soil – Strength



# Stabilised Sulphate soil – Micro feature



# **CONCLUSION**

SN	Key Findings
1.	Soils stabilized by RC incorporation reduced swelling to 0%, reduced settlement by 90% and increased strength by 67% compared to cement used alone.
2.	The moisture-retention capacity of soils stabilised by RC incorporation are higher than those without the RC used but with less gravimetric moisture at zero saturation.
3.	Results indicate the efficacy of RC in reversing the heaving trend on a stabilised sulphate soil compared soil stabilised by calcium-based binders.

**THANKS FOR LISTENING!!!**

ANY QUESTIONS?