

Alkali Silica Reaction in Mortars Containing Recycled Glass Aggregate

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Introduction

The use of waste glass as aggregate replacement in concrete has been studied over the past decades to investigate the possibility of using it as construction materials. The deleterious presence of Alkali Silica Reaction (ASR) has been a considerable concern with such concrete. Studies have been put forward to mitigate such a reaction. Including the use of admixtures and the level of glass aggregate replacement percentages, as well as the use of low alkali cement.

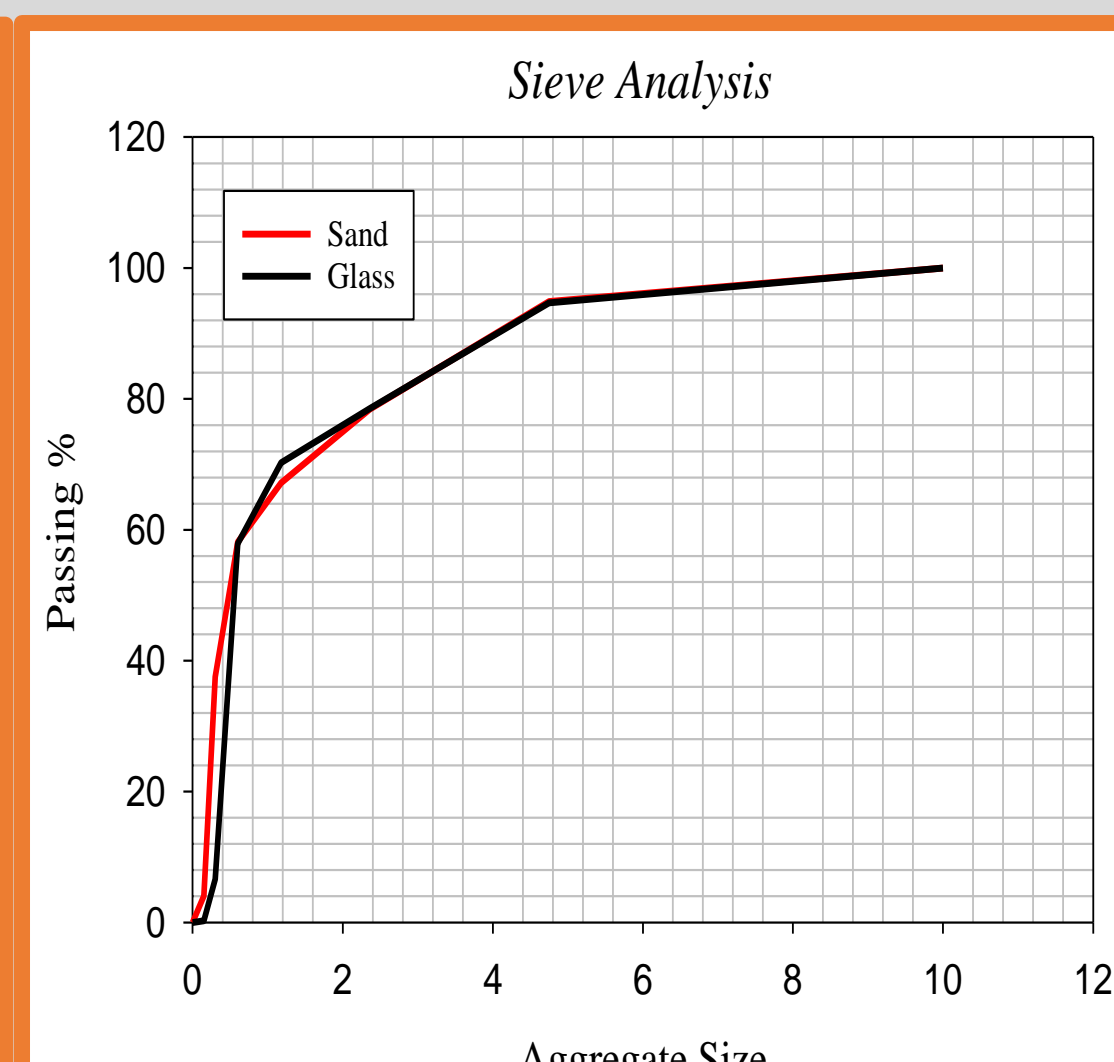
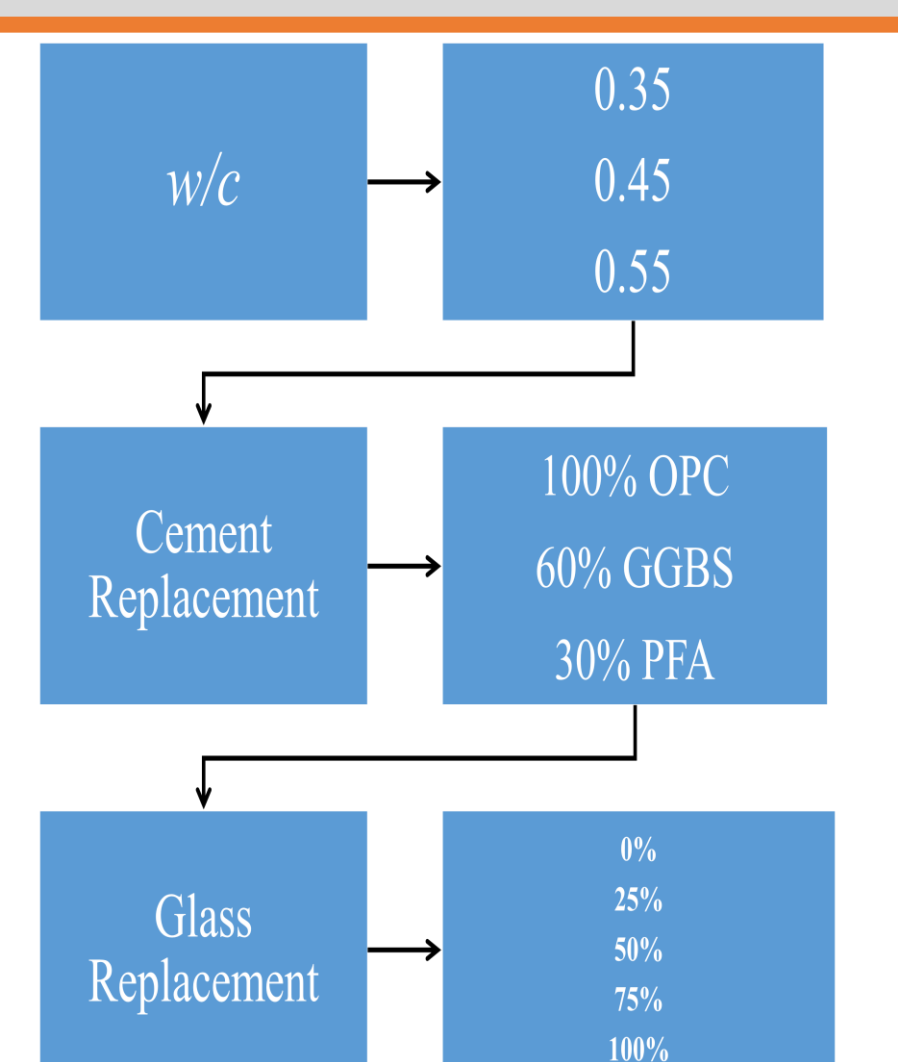
Research Aims & Objectives

This study Aims to investigate the effect of Alkali Silica Reaction (ASR) on mechanical and physical properties of recycled glass mortars, as well as durability, to evaluate the characteristics of concrete with glass sand as fine aggregates.

- Influence of glass replacement percentage
- Influence of Cement Binder
- Influence of Water Cement Ratio

Methodology

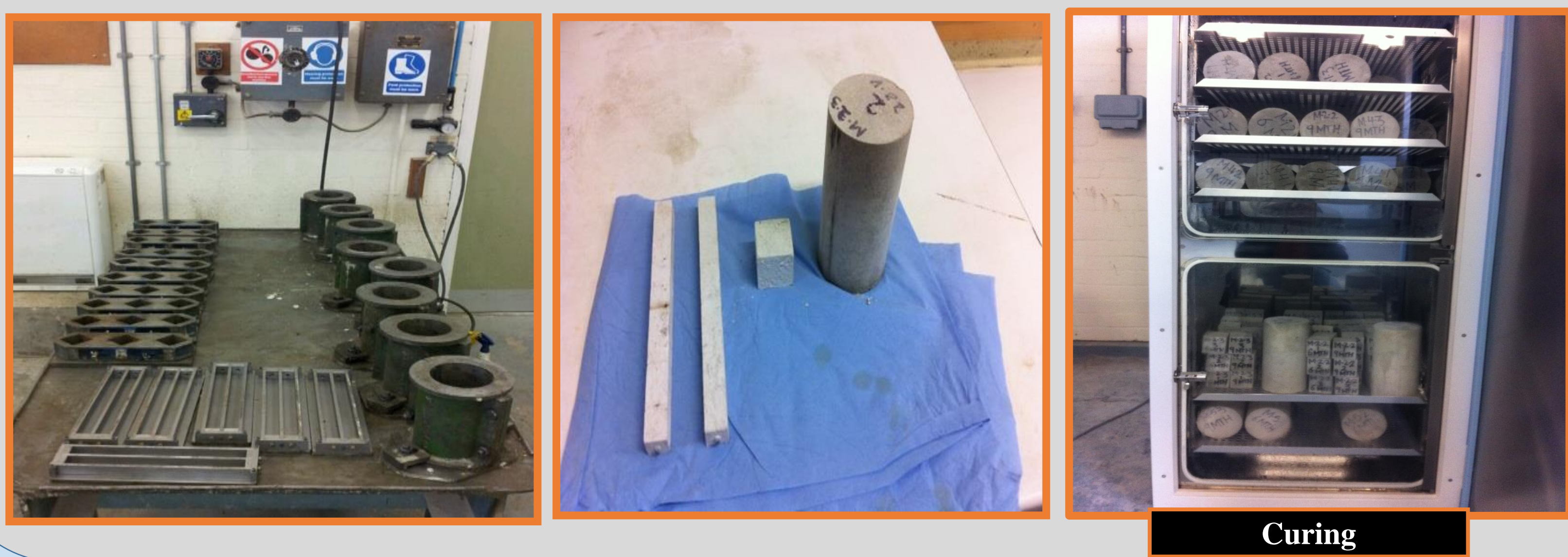
Composition %	Cement CEM1	Natural sand	Glass sand	Fly ash	Slag GGBS
SiO ₂	16.81	92.71	71.21	54.09	34.69
Al ₂ O ₃	5.27	0.82	1.76	24.45	12.25
Fe ₂ O ₃	2.75	2.33	0.29	9.89	1.05
CaO	67.79	1.26	10.91	3.42	39.63
MgO	1.12	0.17	1.16	1.84	7.88
SO ₃	3.74				
Na ₂ O	0.39	0.04	12.98	0.86	0.20
K ₂ O	1.20	0.38	0.64	2.77	0.31
TiO ₂	0.36	0.18	0.08	0.98	0.56
Cr ₂ O ₃	0.01				



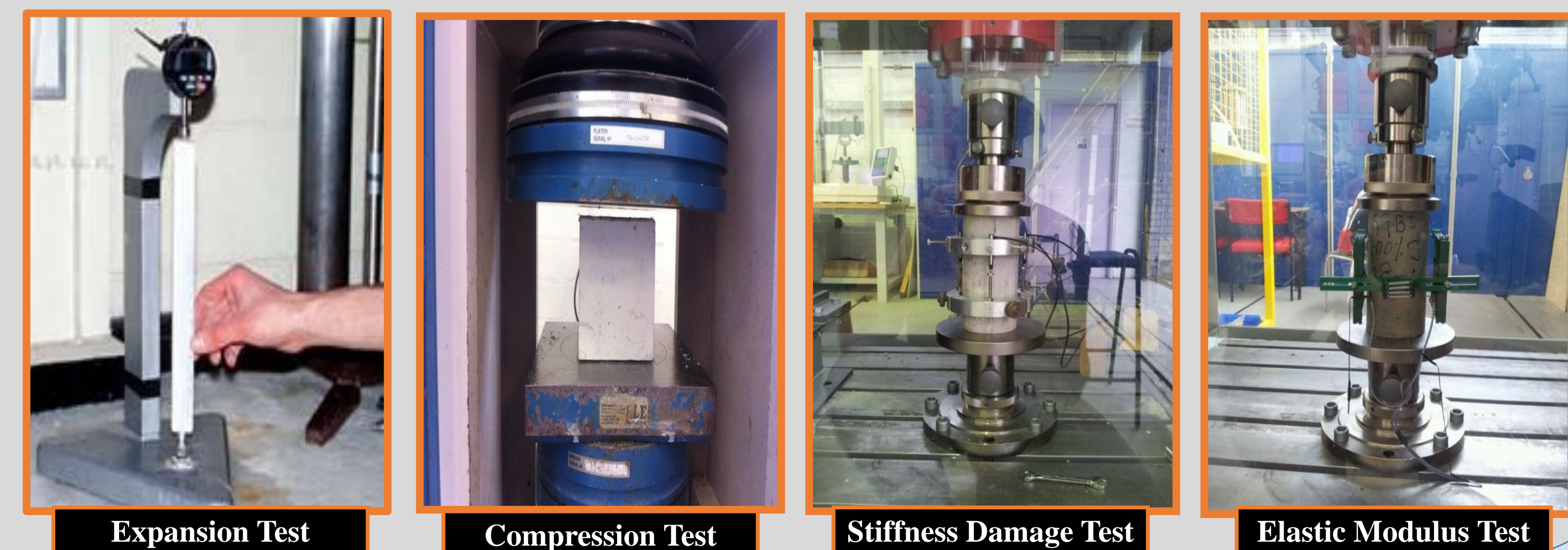
Materials



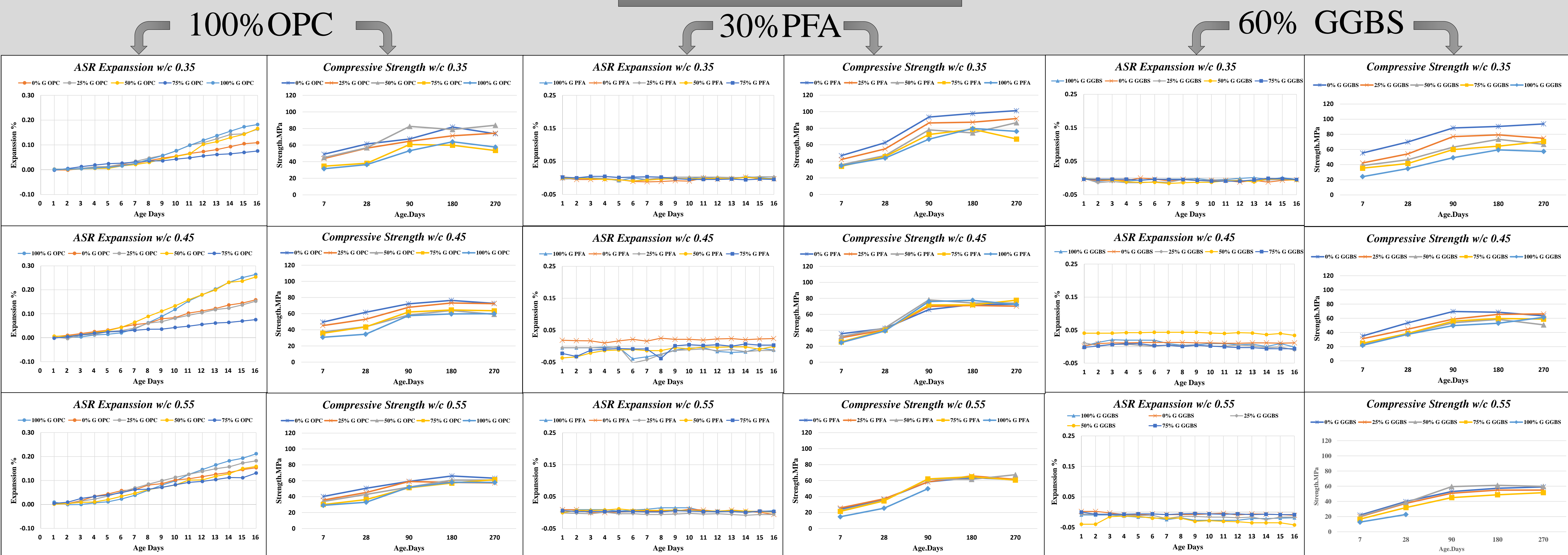
Sampling



Testing



Results



Conclusion

- Glass aggregate has a significant effect on concrete properties due to its low density.
- Compressive strength improves as water cement ratio reduces for mixes with cement binder replacement.
- Glass concrete at various glass sand replacement percentages (without mineral admixtures) showed deleterious ASR expansion at 16 days as glass content increases.,
- Mixes with cement binder replacement up to 100% showed innocuous ASR expansion.

Recycled glass cullet can be used in concrete construction as fine aggregate to improve durability and properties, as it has no deleterious ASR effects depending on water cement ratio and levels of replacement.

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