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# Combined use of waste glass powder and cullet in architectural mortar

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**Abstract:** The use of 100% waste glass cullet (WGC) as fine aggregates in architectural cement-based mortar had been proven to be feasible in previous works. This paper reports a further study on investigating the influence of using waste glass powder (WGP) as a supplementary cementitious material on the properties of glass-based architectural cement mortars. The experimental results showed a good linear relationship between the particle size of WGP and the flow values of the fresh mortar, revealing that the particle size of WGP played an important role in controlling the workability. For the hydration of white cement, the inclusion of WGP not only affected the second exothermic peak of hydration but also changed the third peak. In particular, the result indicated that the use of finer WGP had an advantage in increasing the flexural strength of the cement mortar when compared with the corresponding compressive strength, which was attributed to the morphological and pozzolanic effect of WGP. In addition, the very fine WGP could act as micro-fibers and micro-aggregates in filling the microstructure of the mortar. At 90 days of curing, the mortar prepared with finer WGP showed a distinct improvement in strength due to the improved interfacial transition zone and the pore-size refinement.

**Keywords:** Waste glass powders (WGP); Heat of hydration; Contribution rate to strength (CRS); Interfacial transition zone (ITZ); Pore structure

## 1 Introduction

Waste glass beverage bottles are a major solid waste type in Hong Kong. Although the public has paid more attention on municipal waste separate collection, the recycling rate of waste glass beverage bottles is still very low (less than 10%) [1]. Due to the low commercial value, waste glass beverage bottles are mostly landfilled in Hong Kong rather than collected for recycling. It is estimated that Hong Kong's landfills will be exhausted one by one by 2020 if waste levels continue to increase at current levels. Therefore, the need to recycle more glass waste is crucial to Hong Kong.

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