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# Use of Recycled Glass Powder as a Pozzolanic Material in Partial Replacement of Portland Cement for Mortar Production

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## Abstract

n industry, as well as in cities, a large amount of solid waste is produced, some of which is partially recycled or is disposed of in its entirety in landfills, thereby generating negative environmental impacts. Of this waste, industrial waste glass from many application sources is a major source of pollution. In developed countries, efficient glass recovery and recycling systems are well implemented to avoid waste glass landfilling and its disastrous environmental and economic effects. Yet no effective glass recycling system is established in Oman and many other developing countries which lead to a huge amount of waste glass landfilled and thrown out in the ground. This causes a considerable economic loss and environmental issues.

In the search and for an alternative exploitation of solid waste, various applications have arisen, some of which are related to constructions sector. This research study the use of mixed color waste glass fragments collected from a local Aluminum workshop in Maabilah, ground to approximately a size of cement and used at various replacement levels of Portland cement in mortar production. The results shows that this replacement is possible and even lead to an improvement to some mortar properties if the amount of cement and the glass powder (GP) in the mortar mix are well optimized. Out of this research, GP can improve the flowability of mortar and reduce both water and superplasticizer (SP) demand. The use of GP enhanced the long-term compressive strength, led to a better resistance against chloride penetration, acid and sulphate attacks. The combination of conventional supplementary cementitious materials with GP reveals to be very efficient and promising. Moreover, the use of GP in the mortar has resulted in a reduction in the thermal conductivity and hence a better heat insulation property.

**Keywords:** acid and sulphate attacks, chloride permeability, compressive strength, flow, mixed color waste glass powder, mortar, porosity, thermal conductivity.