



AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Structural Engineering

Performance of Geopolymer Concrete Containing Recycled Rubber

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science In Civil Engineering

(Structural Engineering)

By

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Thesis Title : Performance of Geopolymer Concrete Containing Recycled Rubber.

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Statement

This thesis is submitted as a partial fulfilment of Master of Science in Civil Engineering Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis Summary

For the past few years, the construction field industry is responding to the challenge of incorporating sustainability in the production processes, this was done through the utilization of solid waste materials as aggregates in concrete or via searching for more environmentally friendly raw materials. Producing binders free of Portland cement is one of the most innovative ways to substitute the Portland cement. Using a cementitious material (steel slag or blast furnace slag) or pozzolanic materials (fly ash or silica fume) activated with alkali activators. These alkali-activated binder systems are called geopolymer concrete. One of the possible solutions for the use of waste tire rubber is to incorporate into geopolymer concrete as a substitution of natural aggregate. This study designed to investigate the compressive strength of geopolymer mortar with different percentage of crumb rubber by volume % (10, 20, 30 and 40%) as a replacement of fine aggregate, moreover two types of binders with different ratios will be used to produce geopolymer mortar. Also, the effect of different percentages of crumb rubber as a partial substitution of both; fine, and coarse aggregates by volume percentage (0, 10, 20 and 30%) on the hardened properties (compressive, tensile and flexural strength) and impact resistance of slag based geopolymer concrete (replacing the cement by; ground granulated blast furnace slag (GGBFS) activated with sodium silicate and sodium hydroxide). Finally, the work provides the mix with high compressive strength, ductility and impact resistance to be used in structural elements subjected to impact and dynamic load such as (bridge approach slabs, railway buffers, and airport runways).

Key words:

Geopolymer concrete, Crumb rubber, Blast furnace slag, Compressive strength, Rubberized geopolymer concrete and Impact resistance.

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IN THE NAME OF ALLAH, THE MOST GRACIOUS AND
THE MOST MERCIFUL

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Dedication

To my Supportive, Honest and Real friend

"Eman Lotfy"

To my friends that have a great effect on my life
specially

"Abd El-Rahman Mekkawy"

To my Little Sister whose I always Proud of

"Nada Aly"

To Mom and Dad,

**All my Love and Appreciation to all of you
for your Support.**

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