

Hanaa Mohammed



# بسم الله الرحمن الرحيم

مركز الشبكات وتكنولوجيا المعلومات

قسم التوثيق الإلكتروني



Safaa Mahmoud



# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

## قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
على هذه الأقراص المدمجة قد أعدت دون أية تغييرات





Cairo University

# **MECHANICAL PROPERTIES OF SYNTHESIZED SLAG BASED GEOPOLYMER CONCRETE**

By

**Khaled Moustafa Hussien Shibl**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
in Partial Fulfillment of the  
Requirements for the Degree of  
**MASTER OF SCIENCE**  
in  
**Structural Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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Under the Supervision of  
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Professor of Properties and Strength of Materials  
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**Title of Thesis:**

Mechanical properties of synthesized slag based Geopolymer concrete

**Key Words:**

Slag; Silica fume; Fly ash; Geopolymer concrete; Mechanical properties

**Summary:**

Mechanical properties of slag based geopolymer concrete has been studied with partial replacement of ground granulated blast furnace slag with silica fume, fly ash, and metakaolin. Compressive strength was studied at the ages of 7, 28, and 90 days while splitting, flexural, and bond strength between reinforcement bars and concrete were studied at the age of 28 days. Different replacement percentages of silica fume, fly ash and metakaolin were used instead of slag for 15 concrete mixes with addition to two more concrete mixes with cement and the other is a mixture of cement and slag for comparing purposes. Results revealed that using ground granulated blast furnace slag as a base material gave the highest compressive and indirect tension strength at all ages. However, partial slag replacement with fly ash and metakaolin showed more bond and flexural strengths compared to mixes with no replacement percentages.

## **Disclaimer**

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Khaled Moustafa Hussien

Date:     /     / 2022

Signature:

## **Dedication**

*To my Mother & father,  
The reason of what I became today,  
Thank you for your love, support and care.  
Thank you for always considering education a priority.*

*To my grandfather's soul  
who has always believed in me, pushed me  
and motivated me.*

*To my great professor,  
Dr. Osama Hodhod  
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in a very tight time  
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besides being a tutor  
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# TABLE OF CONTENTS

<b>DISCLAIMER .....</b>	<b>i</b>
<b>DEDICATION .....</b>	<b>ii</b>
<b>ACKNOWLEDGEMENT .....</b>	<b>iii</b>
<b>TABLE OF CONTENTS .....</b>	<b>iv</b>
<b>LIST OF TABLES .....</b>	<b>viii</b>
<b>LIST OF FIGURES .....</b>	<b>ix</b>
<b>NOMENCLATURE .....</b>	<b>xvii</b>
<b>ABSTRACT .....</b>	<b>xviii</b>
<b>CHAPTER 1: INTRODUCTION .....</b>	<b>1</b>
1.1 General.....	1
1.2 Research Objectives .....	2
1.3. Scope of Work .....	2
1.4. Thesis Layout .....	3
1.4.1. Chapter 1: Introduction .....	3
1.4.2. Chapter 2: Background and literature review.....	3
1.4.3. Chapter 3: Experimental program .....	3
1.4.4. Chapter 4: Results and discussion .....	3
1.4.5. Chapter 5: Summary, conclusions, and recommendations .....	3
<b>CHAPTER 2: BACKGROUND &amp; LITERATURE REVIEW.....</b>	<b>4</b>
2.1. General .....	4
2.1.1. Problem .....	4
2.1.2. Historical background .....	5
2.2. Geopolymerization .....	5
2.2.1. Models of Alkali Activation .....	5
2.2.2. Chemistry and mechanism .....	7
2.3. Parameters affecting geopolymer concrete .....	8
2.3.1. Role of Source Material .....	8
2.3.1.1. Geopolymer concrete mixes with FA .....	8
2.3.1.2. Geopolymer concrete mixes with GGBFS .....	19
2.3.1.3. Geopolymer concrete mixes with FA and GGBFS .....	21

2.3.1.4. Geopolymer concrete mixes with FA and SF .....	28
2.3.1.5. Partial cement replacement by FA, SF, and GGBFS.....	31
2.3.2. Sodium hydroxide molarity .....	36
2.3.3. Bond strength .....	40
2.3.4. Effect of curing on GPC mechanical properties .....	43
2.3.5. Effect of binder content and w/b ratio on compressive strength .....	46
<b>CHAPTER 3: EXPERIMENTAL PROGRAM .....</b>	<b>49</b>
3.1. Introduction .....	49
3.2. Experimental program .....	50
3.2.1. Overview of experimental program .....	50
3.2.2. Characterization of used materials .....	51
3.2.2.1. Sodium hydroxide (NaOH) .....	51
3.2.2.2. Sodium silicate ( $\text{Na}_2\text{SiO}_3$ ) .....	52
3.2.2.3. Water .....	52
3.2.2.4. Superplasticizer .....	53
3.2.2.5. Ground granulated blast furnace slag (GGBFS) .....	53
3.2.2.6. Cement .....	55
3.2.2.7. Fly Ash (FA) .....	55
3.2.2.8. Silica fume (SF) .....	56
3.2.2.9. Metakaolin .....	57
3.2.2.10. Sand .....	58
3.2.2.11. Coarse aggregate .....	59
3.2.3 Samples Preparation .....	60
3.2.3.1. Overview of samples preparation .....	60
3.2.3.2. Mixing procedure .....	61
3.2.3.3. Mix design .....	62
3.2.4. Testing .....	64
3.2.4.1. Compressive strength test .....	64
3.2.4.2. Splitting tensile strength test .....	65
3.2.4.3. Flexural strength test .....	66
3.2.4.4. Bond strength test .....	67

<b>CHAPTER 4: RESULTS AND DISCUSSION.....</b>	<b>70</b>
4.1. Introduction .....	70
4.2. Mechanical properties of geopolymer concrete .....	70
4.2.1. Compressive strength .....	70
4.2.1.1. Effect of coarse-to-fine aggregate ratio (C/F) .....	71
4.2.1.2. Effect of presence of FA as a partial replacement of GGBFS.....	72
4.2.1.3. Effect of presence of SF as a partial replacement of GGBFS.....	74
4.2.1.4. Effect of presence of MK as a partial replacement of GGBFS .....	76
4.2.1.5. Effect of partial cement replacement with GGBFS .....	78
4.2.1.6. Effect of alkali activator content in MK based GPC .....	80
4.2.1.7. Effect of water curing .....	82
4.2.1.8. Effect of source material .....	84
4.2.2. Indirect tensile strength .....	86
4.2.2.1. The effect of coarse to fine aggregate ratio (C/F) .....	86
4.2.2.2. Effect of presence of FA as a partial replacement of GGBFS.....	87
4.2.2.3. Effect of presence of SF as a partial replacement of GGBFS.....	88
4.2.2.4. Effect of presence of MK as a partial replacement of GGBFS.....	88
4.2.2.5. Effect of partial cement replacement with GGBFS.....	89
4.2.2.6. Effect of alkali activator content in MK based GPC.....	90
4.2.2.7. Effect of water curing .....	91
4.2.2.8. Effect of source material .....	91
4.2.3. Bond strength .....	92
4.2.3.1. The effect of coarse to fine aggregate ratio (C/F).....	92
4.2.3.2. Effect of presence of FA as a partial replacement of GGBFS.....	93
4.2.3.3. Effect of presence of SF as a partial replacement of GGBFS.....	94
4.2.3.4. Effect of presence of MK as a partial replacement of GGBFS.....	95
4.2.3.5. Effect of partial cement replacement with GGBFS.....	96
4.2.3.6. Effect of alkali activator content in MK based GPC.....	96
4.2.3.7. Effect of water curing .....	97
4.2.3.8. Effect of source material .....	98
4.2.4. Flexural strength .....	98
4.2.4.1. The effect of coarse to fine aggregate ratio (C/F).....	99
4.2.4.2. Effect of presence of FA as a partial replacement of GGBFS.....	99

4.2.4.3. Effect of presence of SF as a partial replacement of GGBFS.....	100
4.2.4.4. Effect of presence of MK as a partial replacement of GGBFS.....	101
4.2.4.5. Effect of partial cement replacement with GGBFS.....	102
4.2.4.6. Effect of alkali activator content in MK based GPC.....	102
4.2.4.7. Effect of water curing.....	103
4.2.4.8. Effect of source material .....	104
<b>CHAPTER 5: SUMMARY, CONCLUSION, AND RECOMMENDATION.....</b>	<b>105</b>
5.1. Summary .....	105
5.2. Conclusions .....	106
5.3. Recommendations .....	108
<b>REFERENCES .....</b>	<b>109</b>

## LIST OF TABLES

<b>Table 3.1:</b> Chemical composition of sodium hydroxide .....	<b>51</b>
<b>Table 3.2:</b> Chemical composition of sodium silicate .....	<b>52</b>
<b>Table 3.3:</b> Chemical and physical characteristics of superplasticizer .....	<b>53</b>
<b>Table 3.4:</b> Chemical composition of GGBFS .....	<b>54</b>
<b>Table 3.5:</b> Physical composition of GGBFS .....	<b>54</b>
<b>Table 3.6:</b> Chemical properties of ordinary Portland cement type I .....	<b>55</b>
<b>Table 3.7:</b> Chemical composition of fly ash .....	<b>55</b>
<b>Table 3.8:</b> Chemical composition of silica fume .....	<b>56</b>
<b>Table 3.9:</b> Chemical composition of metakaolin .....	<b>57</b>
<b>Table 3.10:</b> Fine aggregate sieve analysis .....	<b>58</b>
<b>Table 3.11:</b> Physical properties of fine aggregate .....	<b>59</b>
<b>Table 3.12:</b> Final quantities of mix design in kg/m <sup>3</sup> .....	<b>64</b>

# LIST OF FIGURES

<b>Figure 2.1:</b> Past, current and future estimate of the amount of the world cement production.....	<b>4</b>
<b>Figure 2.2:</b> A schematic diagram for alkali-activated system components .....	<b>5</b>
<b>Figure 2.3:</b> Chemical structures of polysialates .....	<b>7</b>
<b>Figure 2.4:</b> Effect of sodium silicate to sodium hydroxide ratio on compressive strength ..	<b>9</b>
<b>Figure 2.5:</b> Effect of the ratio of alkaline liquid to fly ash on compressive strength .....	<b>9</b>
<b>Figure 2.6:</b> Effect of curing time on compressive strength .....	<b>10</b>
<b>Figure 2.7:</b> Effect of percentage of superplasticizer on compressive strength .....	<b>10</b>
<b>Figure 2.8:</b> Effect of water to binder ratio on compressive strength .....	<b>10</b>
<b>Figure 2.9:</b> Effect of w/b ratio on the compressive strength .....	<b>11</b>
<b>Figure 2.10:</b> Effect of curing temperature on compressive strength .....	<b>12</b>
<b>Figure 2.11:</b> Effect of curing time on compressive strength .....	<b>12</b>
<b>Figure 2.12:</b> Effect of percentage of superplasticizer on compressive strength .....	<b>13</b>
<b>Figure 2.13:</b> Effect of water/geopolymer solids on compressive strength .....	<b>13</b>
<b>Figure 2.14:</b> Effect of additional water content on compressive strength .....	<b>14</b>
<b>Figure 2.15:</b> Effect of additional water content on tensile strength .....	<b>15</b>
<b>Figure 2.16:</b> Effect of chemical admixture content on compressive strength .....	<b>15</b>
<b>Figure 2.17:</b> Effect of chemical admixture content on tensile strength .....	<b>15</b>
<b>Figure 2.18:</b> Effect of NaOH molarity on compressive strength .....	<b>16</b>
<b>Figure 2.19:</b> Effect of NaOH molarity on tensile strength .....	<b>16</b>