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Experimental Study on Strength of Engineered Cementitious Composite Prepared By Using Alccofine and Fly Ash

Parul Khaped[1], Prof . Jignesh Solanki[2], Prof. M A Jamnu[3]
[1]*M.E Student, Dept. of Structural Engineering Nobel Engineering College junagadh, Gujarat, ndia*
[2]*Noble Engineering College, junagadh , Gujarat , india,*
[3]*Assistant Professor, Applied Mechanics Departmen t GEC Godhra, Goghra Gujarat, India.*

Abstract: Engineered cementitious composites abbreviated as ECC. Engineered cementitious Composite (ECC) is an ultra ductile Fibre reinforced cementitious composites characterized by high ductility and tight crack width control. This paper presents current scenario about various active research that are taking place around the world on study of performance of engineered cementitious composite (ECC) by incorporating polyvinyl alcohol (PVA) and other kinds of fibers using various mineral admixture. Here partial replaced of fly ash And Alccofine with cement with 10%, 15%, 20%, 25%. This material is capable to exhibit considerably enhanced flexibility. Engineered cementitious composite (ECC) is a unique type of cement mixture that exhibited superior tensile strain – harding compared to normal fiber reinforced concrete (FRC). the volume fraction of the fiber used is also less than 2 percent and showing an extensive strain hardening experimental study. this paper investigate the effects of polyvinyl alcohol (PVA) on the toughness ,compressive and flexural strength of engineered cementitious composite cubes And beam. compressive test and flexural tests were carried out to investigate the flexural properties of PVA fiber reinforced engineered cementitious composites (ECC) with different mix proportions. Simulation with the model shows that when the ECC thickness goes beyond a certain critical value , both the flexural strength and ductility will significantly increase. this thesis aims at making ECC with a mix which satisfies the strength characteristics required. therefore . various trial mixes are cast and the mix design is finalize

Keyword: Cement, Fine Aggregate, ECC, fly Ash, Alccofine 1203, PVA Fibers, Superplasticizer (PC Base) and Acid (HCL and H_2SO_4***)***

I. INTRODUCTION

Engineered Cementitious Composites (ECC, Also Knowen as “ECC Concrete”) Developed in The Last Decade, May Contribute to Safer, More Durable, And Sustainable Infrastructure That Is Cost Effective and Constructioned with Conventional Construction Equipment. With Two Percent by Volume of Short Fibers, Ecc Has Been Prepared in Ready –Mix Plants and Transported to Construction Sites Using Conventional Ready Mixed Trucks. The Mixed Can Be Place with Out the Need for Vibration Due to SelfConsolading Characteristics. The Moderately Low Fibre Contain had Also Made Shotcreting ECC Viable. Furthermore, The Most Expensive Component of the Composite Fibers, Is Minimized Resulting in ECC Is More Acceptable to The Highly Cost Sensitive Construction Industry.

It Is Ductile in Nature. Under Flexure, Normal Concrete Fractures in A Brittle Manner. In Contrast, Very High Curvature Can Be Achieved for Ecc at Increasingly Higher Loads, Much Like a Ductile Metal Plate Yielding. Extensive Inelastic Deformation in ECC Is Achieve Via Multiple Micro-Crakes, With Widths Limited Below 60um (About Half the Diameter of a Human Hair). This Inelastic Deformation, Although Different Form Dislocation Movement, Is Analogous to Plastic Yielding in Ductile Metal Such That the Material Undergoes Distributed Damage Throughout the Yield Zone.

The Tensile Strain Capacity of ECC Can Reach 3-5%, Compared to 0.01% For Normal Concrete. Structural Designers Have Found the Damage Tolerance and Inherent Tight Crack Width Control of ECC Attractive in Recent Full-Scale Structural Application. The Compressive Strength of ECC Is Similar to That of Normal to High Strength Concrete. The Aim of Using ECC with Ductile Behaviour of Concrete, Crake Resistance Capacity and Concrete Should Give Warning Before Its Failure. Normal Concrete Is Brittle in Nature While ECC Is Ductile in Nature. Due to This Property; It Has Wide Application and Wide Future Scope in Various Fields. In terms of material components, ECC uses components similar to Fiber Reinforced Concrete (FRC). It contains water,

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cement, sand, fiber and some common chemical additives. Rough aggregates are not used because they tend to adversely affect the inherent ductile behaviour of the composite. Typical compositions use a w / c ratio and a sand / cement ratio of 0.5 or less.

In terms of material components, ECC uses components similar to Fiber Reinforced Concrete (FRC). It contains water, cement, sand, fiber and some common chemical additives. Rough aggregates are not used because they tend to adversely affect the inherent ductile behaviour of the composite.Typical compositions use a w/ c ratio and a sand / cement ratio of 1 or less. Unlike some high performance FRCs, ECC does not use large amounts of optical fiber. Engineered Cementitious Composite Is Composed of Cement, Sand Fly Ash, Water, Small Amount of Admixtures and an Optimal Amount of Fibre. In Mix Coarse Aggregates Are Deliberately Not Used because Properties of Ecc Concrete Is Formation of Micro Crack with Large Deformation. Coarse Aggregates Increases Crack Width Which Is Contradictory to The Property of ECC Concrete.

PVA Fiber Has Suitable Characteristics as Reinforcing Materials for Cementitious Composites. High Modulus of Elasticity, Durability, Tensile Strength and Bonding Strength with Concrete Matrix Are Some of Its Desirable Properties. PVA Fiber Has High Strength and Modulus of Elasticity (25 To 40gpa) Compared to Other General Organic Fiber Which Widely Used for Cement Reinforcing. Fiber Elongation is About 6-10%. The Tensile Strength of Fiber is 880-1600mpa.ECC is a special type of HPFRCC prepared by achieving two important properties of ECC: ultra-high ductility and rigid crack width control, and critical fiber volume fraction for different types of fibers. The crack width of the ECC is maintained at less than 100 pm even at a strain of 4-5%. These small crack widths mean a significant improvement in structural durability. These properties can be achieved using a micromechanical based design approach. The fine mechanical parameters associated with the fibers , matrix and interface are combined to meet a pair of criteria, the first crack stress criteria to achieve stress-hardening behaviour, and steady-state crack criteria. In addition, the fibers are expected to carry loads and are inherent in the structural response.It is a pressing need today for the concrete industry to produce concrete with lower 10 environmental impact, these-called green concrete. This can be achieved in three ways. The first one is by reducing the quantity of cements one tonne of cement saved will save equal amount of CO2 to be discharged into atmosphere. Secondly by reducing the use of natural aggregates whose resources are limited and are exhausting very fast. It is also achieved by utilizing maximum possible waste materials like fly ash, Ground Granulated Blast Furnace Slag, Rice husk ash and silica fume are some of the pozzolanic materials in concrete.

Fly ash is generally used as replacement of cement, as an admixture in concrete, and in manufacturing of cement. Concrete containing fly ash as partial replacement of cement poses problems of delayed early strength development.This higher workability and strength achieved gives scope for indirectly reducing the cement quantity in concrete. Earlier investigations in respect of development of strength of cement mortars with fly ash showed the 50% to 80% increase in 91 days' strength. For better packing of concrete more quantity of particle size less than 75 microns is highly desirable. This addition of finer particles will also increase the water requirement of the concrete mix. Addition of fly ash as replacement of sand fulfils this requirement of additional finer particles and improves workability and strength at same water content.

Figure 1: fly ash and Alccofine 1203 , PVA fiber

II. MATERIALS

A. PVA Fiber

PVA fibers have suitable properties as reinforcing materials for cementitious composites. High modulus, durability, tensile strength and bond strength to concrete matrix are some of the desirable characteristics. PVA fiber has higher strength and elastic modulus (25 ~ 40 GPa) than other general organic fibers widely used for cement reinforcement. Fiber elongation is about 6-10%. Tensile strength of fiber is 880-1600MPa. Below. One of the notable characteristics of PVA fiber is its strong bond with cement matrix.

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Length mm	Diameter micrometer	Specific gravity (g/cm3)	Tensile strength Mpa	Melting point	Modulus of elasticity Gpa	Elongation %
6	39	1.3	1620	230 C	42.8	7

PVA fibers have suitable properties as reinforcing materials for cementitious composites. High modulus, durability, tensile strength and bond strength to concrete matrix are some of the desirable characteristics.

B. Fly Ash

This addition of finer particles will also increase the water requirement of the concrete mix. Addition of fly ash as replacement of sand fulfils this requirement of additional finer particles and improve workability and strength at same water content Replacement levels of primary class fly ash have ranged from 30-75% by solid volume of cementitious material. In proportioning mixes for minimum past volumes one principal function of a fly ash is to occupy void space which would otherwise be occupied by cement or water

1) Chemical Property Of Fly Ash

TEST NAME		Unit	Result	Specification As per IS : 3812 (Part-1)-2003
CHEMICAL PARAMETER				
1	Total sulphur as Sulphur trioxide(SO_3)	%	0.92	Max. :3.0
2	Available alkalis as Sodium oxide (Na_2O)	%	0.75	Max. :1.5
3	Silicon dioxide, as SiO_2	%	53.15	Min. :35
4	SiO_2+Al_2O_3+Fe_2O_2	%	90.14	Min. :70
5	Reactive Silica	%	31.78	Min. :20
6	Magnesium Oxide(MgO)	%	1.76	Max. :5.0
7	Total Chlorides	%	0.16	Max. :0.05

2) Physical Property Of Fly Ash

TEST NAME		Unit	Result	Specification As per IS : 3812 (Part-1)-2003
1	Loss on Ignition	%	1.40	Max. :5.0
2	Fineness Specific Surface by blain	M^2/Kg	380.2	Min. :320
3	Moisture	%	0.29	Max. : 2
4	Passing on 45 micron sieve (Wet sieving)	%	85.98	Min. : 66
5	Retention on 45 micron sieve (Wet sieving)	%	14.02	Max. : 34

3) *Alccofine 1203:* Alccofine is specially processed product based on slag of high glass contect with high reactivity obtained through the process of controlled granulation.The raw materials are composed primary of law calcium silicates. Alccofine is a new generation, ultrafine ,low calcium silicate product manufactured in india .If the advantages of alccofine 1203 are observed in the concrete mix design the initial rate of strength development was found to be increase or similar as that of silica fume**.**

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4) Physical Property Of Alccofine 1203

Sr no	Test conduct	Result
1	Specific gravity	2.81
2	Compressive strength at 7 days as percent of control sample	110
3	Oversize percentage retained 5 micron IS sieve	Nil

5) Chemical Parameter Of Alccofine 1203

Parameters conducted	Test result (% by mass)
Insoluble residule(IR)	0.46
Magnesium oxide (mgo)	6.06
Sulphide sulphur (s/s)	0.44
Manganese oxide (mn2o3)	0.13

III. EXPERIMENTAL WORK

A. Mix Design

As the development of ECC started since long no codes and standards are available for ECC particularly in India. ECC is one type of trail and error method. After few trials decide final proportion. The water-cement ratios have been varied from 0.30 to 0.45 while the rest of the components were kept the same, except the chemical admixtures, which were adjusted for obtaining the self-compact ability of the concrete.

B. Mix Design Approach

1) The recent amendment in IS 456:2000 (Annexure-1), Aug-2007, gives the guidelines about application of ECC and features of fresh ECC. However reference for the detail guidelines and specification is taken from japan guidline to refer and used in mix design, which says that a concrete can be classified as ECC only if it fulfils the three properties of workability.
2) Filling Ability – Ability of concrete to fill all shapes under its own weight.
3) Slum flow in 3 to 5 seconds between 500 to 600. This is main criteria to decide the mix design.

C. Trialmixed

TRIAL	Cement	sand	w/c	sp dose %	Slump flow (mm)	Remark
ECC1	1	0.60	0.30	00	436	Not accept
ECC2	1	0.60	0.35	0.10	465	Not accept
ECC3	1	0.70	0.40	0.20	471	Not accept
ECC4	1	0.80	0.40	0.30	480	Not accept
ECC5	1	0.90	0.45	0.40	490	Not accept
ECC6	1	1	0.45	0.50	555	Acceptable

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D. Workablity

MIX	W/C RATIO	SP DOSE %	WORKABILITY OF ECC WITH 0.2% PVA FIBER SLUMP FLOW (MM)	WORKABILITY OF ECC WITH 0.3% PVA FIBER SLUMP FLOW (MM)	WORKABILITY OF ECC WITH 0.4% PVA FIBER SLUMP FLOW (MM)
ECC 1	0.45	0.50	585	570	560
ECC2	0.45	0.50	600	585	575
ECC3	0.45	0.50	635	625	600
ECC4	0.45	0.50	570	560	550

E. Compressive Strength Test

Compressive strength is one of the most important engineering property of Concrete which designers are concerned of. It is a standard industrial practice that the concrete is classified based on grades. This grade is nothing but the Compressive Strength of the concrete cube or cylinder. Cube or Cylinder samples are usually tested under a compression testing machine to obtain the compressive strength of concrete. Cubes of size 150 X 150 X 150 mm were casted and cured for 28 days and tested on compression testing machine of capacity 3000kN.

Compressive Strength test results at 28 days (FLY ASH as partial replacement of cement)

Mix	% fly ash	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Compressive Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4% PVA FIBER
ECC1	10	1	0.45	0.50	44.17	44.65	45.53	45.32	47.17	47.65
	10				4.22		45.27		48.22	
	10				44.56		45.18		47.56	
ECC2	15	1	0.45	0.50	48.53	48.42	52.43	50.28	50.19	50.84
	15				48.67		52.37		51.14	
	15				48.06		53.59		51.20	
ECCC3	20	1	0.45	0.50	53.02	52.70	53.99	53.92	54.77	54.81
	20				52.43		54.45		55.11	
	20				52.93		53.45		54.55	
ECC4	25	1	0.45	0.50	32.29	31.65	27.17	26.99	23.10	23.32
	25				31.18		26.75		23.87	
	25				31.17		27.05		23.50	

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Compressive Strength test results at 28 days (as partial replacement of cement)

Mix	% Alccofine	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Compressive Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
ECC1	10	1	0.45	0.50	42.89	42.35	44.09	44.18	45.09	45.18
	10				41.55		44.46		44.46	
	10				42.89		43.98		45.98	
ECC2	15	1	0.45	0.50	48.22	47.65	48.53	48.42	50.87	50.43
	15				47.56		48.06		49.79	
	15				47.17		48.67		50.64	
ECCC3	20	1	0.45	0.50	50.65	50.85	52.43	52.80	57.33	57.10
	20				50.12		52.37		56.67	
	20				51.07		53.59		57.20	
ECC4	25	1	0.45	0.50	32.79	33.07	28.03	29.18	28.85	28.74
	25				33.87		29.70		28.41	
	25				32.55		29.81		28.95	

Compressive Strength test results at 28 days (fly ash + alccofine 1203 as partial replacement of cement)

Mix	% FLY ASH + ALCCOFINE	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Compressive Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
ECC1	10	1	0.45	0.50	30.19	30.30	33.29	32.83	33.20	33.47
	10				30.27		32.04		33.06	
	10				30.45		33.17		34.14	
ECC2	15	1	0.45	0.50	35.08	34.96	35.14	35.55	36.24	36.41
	15				34.56		35.30		36.43	
	15				35.23		36.22		36.57	
ECCC3	20	1	0.45	0.50	37.13	37.81	39.73	39.75	45.83	45.26
	20				38.17		40.07		44.35	
	20				38.14		39.45		45.61	
ECC4	25	1	0.45	0.50	29.74	29.36	26.79	26.91	25.15	24.66
	25				29.20		27.39		24.37	
	25				29.13		25.56		24.46	

F. Flexural Strength Test

Flexural strength also known as modulus of rupture, or bend strength, or transverse rupture strength is a material property, defined as the stress in a material just before yields in a flexure test.

Flexure strength is one measure of the tensile strength of concrete.

It is a measure of an unreinforced concrete beam or slab to resist failure in bending.Beam of size 500 X 100 X 100 mm were casted and cured for 28 days and tested on Digital Flexural testing machine of capacity 100 kN.

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Flexural Strength Test Results At 28 Days (Fly Ash As Partial Replacement Of Cement)

Mix	% FLY ASH	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Flexural Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
	10				4.51		5.03		4.83	
ECC1	10	1	0.45	0.50	4.46	4.57	4.57	4.76	5.20	4.93
	10				4.73		4.68		4.77	
	15				5.19		5.05		5.19	
ECC2	15	1	0.45	0.50	5.03	4.97	4.93	5.06	5.33	5.14
	15				4.71		5.10		4.91	
	20				5.10		5.45		6.19	
ECCC3	20	1	0.45	0.50	5.55	5.30	5.17	5.41	5.87	6.10
	20				5.27		5.63		6.20	
	25				3.51		3.14		3.07	
ECC4	25	1	0.45	0.50	4.07	3.79	3.39	3.47	2.93	3.05
	25				3.80		3.87		3.15	

Flexural Strength test results at 28 days (ALCCOFINE as partial replacement of cement)

Mix	% FLY ASH	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Flexural Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
	10				4.13		4.88		5.19	
ECC1	10	1	0.45	0.50	4.46	4.14	5.01	4.94	4.91	5.14
	10				4.73		4.93		5.33	
	15				5.61		5.77		5.63	
ECC2	15	1	0.45	0.50	4.76	5.31	5.14	5.58	5.97	5.79
	15				5.55		5.83		5.77	
	20				6.02		6.20		6.47	
ECCC3	20	1	0.45	0.50	5.79	5.96	6.19	6.10	6.33	6.33
	20				6.09		5.87		6.21	
	25				3.87		3.66		3.61	
ECC4	25	1	0.45	0.50	3.65	3.76	3.50	3.50	3.20	3.44
	25				3.77		3.33		3.53	

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Flexural Strength test results at 28 days (FLY ASH +ALCCOFINE as partial replacement of cement)

Mix	% FLY ASH	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Flexural Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
ECC1	10	1	0.45	0.50	4.63	4.54	6.14	6.38	7.68	7.90
	10				4.46		6.07		8.13	
	10				4.54		6.94		7.89	
ECC2	15	1	0.45	0.50	5.23	5.05	6.48	6.44	7.67	8.08
	15				5.08		6.70		8.06	
	15				4.85		6.14		8.50	
ECCC3	20	1	0.45	0.50	5.51	5.14	7.21	7.08	8.92	8.40
	20				5.09		6.2		8.51	
	20				4.84		7.91		7.79	
ECC4	25	1	0.45	0.50	3.85	3.88	6.20	5.80	6.75	6.70
	25				4.21		5.06		7.32	
	25				3.58		6.14		6.03	

G. *Durability Test*

1) *Acid Attack Test:* The acids most commonly attacked by concrete are carbonic acid, humic acid, and sulphuric acid. The bureau of Indian standard specified the maximum chloride content in cement as 5 percent. But it is now increased the allowable chloride content in cement to 0.1 percent. The cubes were cast of size 150 x 150 x 150 mm and kept at least 90 percent relative humidity for 24 hours. After 24 hours the cubes were unmoulded and immersed in fresh water for 28 days. After 28 day curing cubes were immersed in 5% concentrated HCL and H_2SO_4 for 56 days. After 56 days cubes were tested for compressive strength test.

Durability results for HCL (alccofine +fly ash)

Mix	% FLY ASH	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Compressive Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
ECC1	10	1	0.45	0.50	24.52	24.53	28.21	28.23	29.37	29.73
	10				24.33		28.63		30.17	
	10				24.73		27.86		29.66	
ECC2	15	1	0.45	0.50	26.49	26.76	31.07	31.35	33.54	33.50
	15				27.03		31.56		33.85	
	15				26.76		31.43		33.11	
ECCC3	20	1	0.45	0.50	32.02	32.24	35.45	35.90	39.96	39.77
	20				32.26		36.02		39.75	
	20				32.44		36.22		39.59	
ECC4	25	1	0.45	0.50	20.12	20.43	21.51	21.14	19.22	19.37
	25				21.03		21.13		19.15	
	25				20.15		20.77		19.74	

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Durability results for H2SO4 (Alccofine +fly ash)

Mix	% FLY ASH	PVA Fiber %	Water/powder ratios	Super plasticizer Dosages %	Compressive Strength (N/mm^2)					
					28 Days	Average With 0.2% PVA FIBER	28 days	Average With 0.3% PVA FIBER	28 Days	Average With 0.4 % PVA FIBER
ECC1	10	1	0.45	0.50	23.14	23.18	27.33	27.55	28.21	28.52
	10				23.17		27.54		29.01	
	10				23.24		27.78		28.33	
ECC2	15	1	0.45	0.50	25.09	25.32	30.99	30.98	33.07	32.77
	15				25.69		30.43		33.20	
	15				25.17		31.53		32.06	
ECCC3	20	1	0.45	0.50	31.43	31.96	35.41	35.68	38.19	39.00
	20				32.84		35.66		39.48	
	20				31.61		35.97		39.33	
ECC4	25	1	0.45	0.50	19.45	19.46	20.85	20.51	18.02	18.24
	25				19.58		20.62		18.55	
	25				19.36		20.07		18.14	

IV. CONCLUSION

A. After the detailed experimental study carried out following remarkable concluding points have been observed

B. Replacement of fly ash or Alccofine improved Workability as well as Strength of Engineered Cementitious composite Concrete. Fly ash , Alccofine may be safely replaced up to 20% and gain optimum strength.

C. If fly ash or / with Alccofine is replaced by 20% the mix results more strength along with good workability than normal concrete.

D. If Alccofine is replaced by 20% with 0.4% PVA fibers the compressive strength is increased compare to normal concrete. The addition of PVA Fibers improved compressive strength and durability marginally while the flexural strength is improved largely.

E. The Optimum result for flexural strength gain with 0.4% PVA fiber with 20% replacement of Alccofine.

F. Same as 0.4% PVA fiber with 20% replacement of (fly ash+ Alccofine) perform well with Flexure Strength. Up to 20% of Alccofine and Fly ash replacement found to be the favorable amount in order to get Optimum Flexure Strength. Use of PVA Fibers may effect workability.

G. Replacement of Alccofine and Fly ash is Eco-friendly, economical. Replacement of Alccofine and fly ash it is suitable for mass concreting work.

H. The specimen which contains PVA Fiber gives ductile failure rather than brittle failure which is observed with 04 % PVA Fibers.

I. Durability tests show that there is large reduction in strength for normal concrete but the reduction may be controlled using fly-ash , Alccofine and PVA Fibers.

J. Experimental result showed that fly As, alccofine can be successively used as cement supplementary material for achieving economical and durable concrete.

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REFERENCES

[1] Alberti M G, Enfedaque A, Galvez J C, Canovas M F and Osorio I R (2014), "Polyolefin fibrereinforced concrete enhanced with steel-hooked fibres in low proportions", Journal of Materials and Design, Vol. 60, pp. 57–65.

[2] Bensaid Boulekbache, Mostefa Hamrat, Mohamed Chemrouk and Sofiane Amziane (2012), "Influence of yield stress and compressive strength on direct shear behaviour of steel fibrereinforced concrete", Journal of Construction and Building Materials, Vol. 27, pp. 6–14.

[3] Jian Zhou, Shunzhi Qian, Guang Ye, Oguzhan Copuroglu, Klaas van Breugel and Victor C Li (2012), "Improved fibre distribution and mechanical properties of engineered cementitious composites by adjusting the mixing sequence", Journal of Cement & Concrete Composites, Vol. 34, pp. 342–348.

[4] Jun Zhang, Zhenbo Wang and Xiancun Ju (2013), "Application of ductile fibre reinforced cementitious composite in joint less concrete pavements", journal of Composites, Part B, Vol. 50, pp. 224– 231.

[5] Maulin Bipinchandra Mavani M E (2012), Thesis, "Fresh/Mechanical/ Durability Properties and Structural Performance of Engineered Cementitious Composite (ECC)", Ryerson University.

[6] Mustafa Sahmaran, Zafer Bilici, Erdogan Ozbay, Tahir K. Erdem, Hasan E Yucel and Mohamed Lachemi (2013), "Improving the workability and rheological properties of Engineered Cementitious Composites using factorial experimental design", Journal of Composites: Part B, Vol. 45, pp. 356-368.

[7] Pajak M and Ponikiewski T (2013), "Flexural behaviour of self-compacting concrete reinforced with different types of steel fibres", Journal of Construction and Building Materials, Vol. 47, pp. 397-408.

[8] Qian S Z, Zhou J and Schlangen E (2010), "Influence of curing condition and precracking time on the self-healing behaviour of Engineered Cementitious Composites", Journal of Cement & Concrete Composites, Vol. 32, pp. 686– 693.

[9] Soutsos M T, Le T T and Lampropoulos A P (2012), "Flexural performance of fibre reinforced concrete made with steel and synthetic fibres", Journal of Construction and Building Materials, Vol. 36, pp. 704-710.

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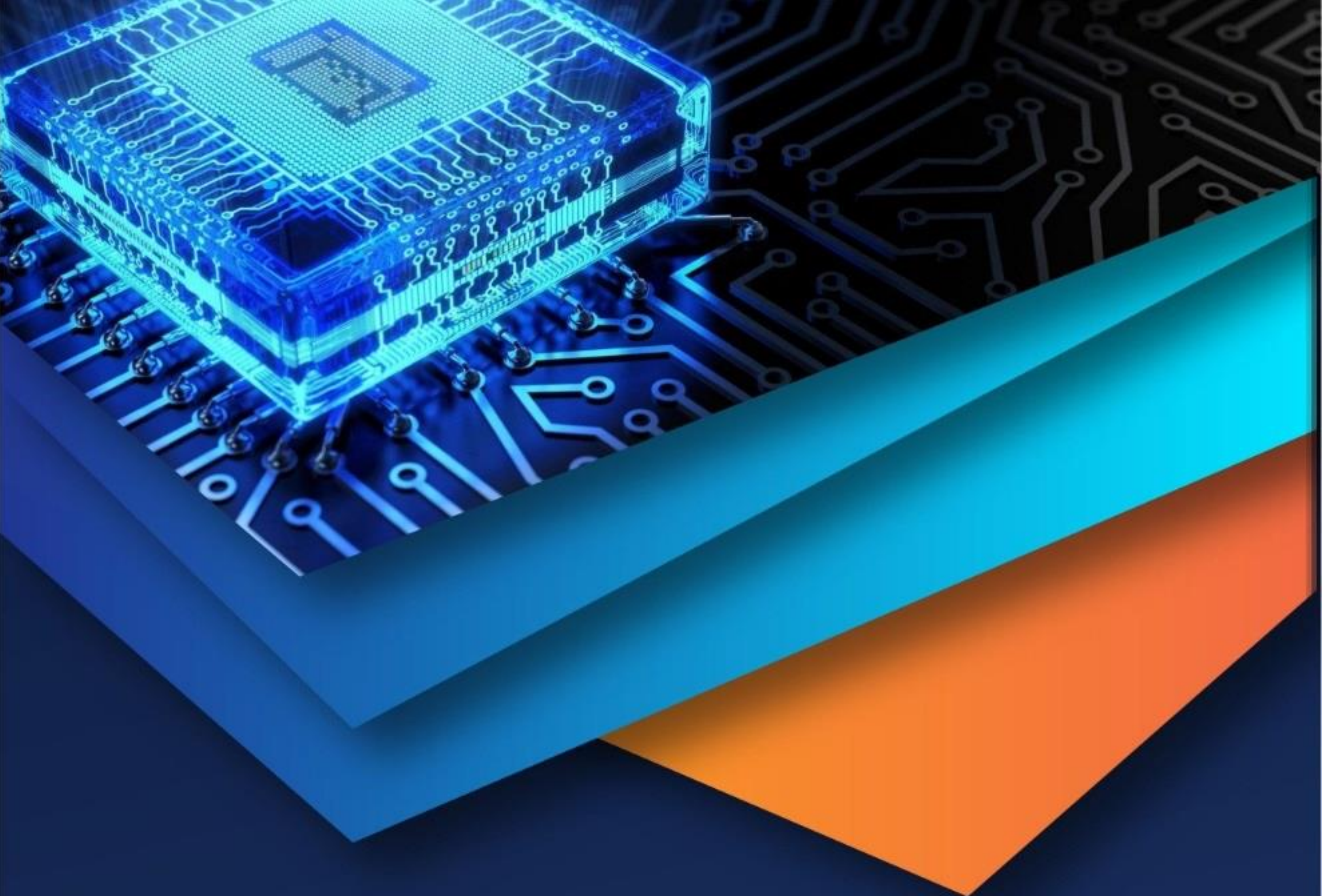

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