

# DEVELOPMENT OF SELF COMPACTING CONCRETE BY USING MICROCLINE POWDER

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**Abstract-** Self-compacting concrete, also referred to as self-consolidating concrete, is able to flow and consolidate under its own weight and is de-aerated almost completely while flowing in the formwork. It is cohesive enough to fill the spaces of almost any size and shape without segregation or bleeding. This makes SCC particularly useful wherever placing is difficult, such as in heavily-reinforced concrete members or in complicated work forms.

This research study reports the potential use of Microcline powder as a replacement for cement in concrete. Based on value of optimum percentage it will be decided to replace cement by Microcline powder in concrete and improvement in fresh properties of self compacting concrete and mechanical properties in M30 & M40 grade.

**Keywords-** Compressive strength, Split Tensile strength, Self compacting concrete, Microcline powder

## I. INTRODUCTION

Self – compacting concrete (SCC) is a fluid mixture, which is suitable for placing difficult conditions and also in congested reinforcement, without vibration. In principle, a self – compacting or self – consolidating concrete must have a fluidity that allows self – compaction without external energy remain homogeneous in a form during and after the placing process and flow easily through reinforcement.

**Filling ability:-** The ability of SCC to flow under its own weight into and fill completely all spaces within difficult formwork such as reinforcement.

**Passing ability:-** The ability of SCC to flow through openings approaching the size of the mix coarse aggregate, such as the spaces between steel reinforcing bars, without segregation.

**Resistance to segregation:-** The ability of SCC to remain homogeneous during transport, placing, and after placement.

## II. MATERIALS AND METHODS

### Cement:

Cement constitutes only 10% of the volume of the mixture, which is the active part of the binding medium and is the only ingredient that is scientifically controlled. The cement content of SCC is 350 - 600kg / m<sup>3</sup>. Cement content above 500 kg / m<sup>3</sup> can be dangerous and can increase shrinkage. Cements less than 350 kg / m<sup>3</sup> may only be suitable if they contain other fine fillers such as Microcline powder, pozzolana, and the like. Too much cement content makes the mixture "sticky" and reduces workability.

Specific gravity of cement is 2.7066

### Coarse Aggregates:

The simple fact is that aggregates account for 70-80% of the concrete volume.

Specific gravity of coarse aggregate is 2.745

Impact value is 4.69%

Fineness modulus is 3.22

### Fine Aggregate:

Aggregates less than 4.75 mm are regarded as fine aggregates. All normal concrete sand is suitable for SCC. The fine aggregate content should be in the range of 1/4 to 1/3 of the total volume of the mixture.

Specific gravity of fine aggregate is 2.64

Fine aggregate is zone 2 type aggregate

### Microcline powder

Microcline Powder materials play an important role in SCC. A fine mortar is required to prevent separation from the SCC. If only cement is used extensively for this purpose, it will cost more and, at the same time, lead to hydration, drying shrinkage and creep. In order to avoid this problem, it is necessary to use microcline powder material, which not only saves cost but also improves workability.

Microcline powder is use in self compacting concrete 4%, 8%, 12%, 16%.

cement paste, an equivalent test using a smaller funnel (5 mm side) is used for the cement paste.

Table :- 1 Physical property of microcline powder

<b>Colour</b>	White Powder
<b>Hardness</b>	6.3
<b>Specific gravity</b>	2.5

Table :-2 Chemical Property of microcline powder

Oxide	%
K2O	16.92%
AL2O3	18.32%
SIO2	64.76%

### III. RESULTS AND DISCUSSION

#### Slump Flow Test:

The SCC have good filling capacity and consistency when the spread diameter reaches a value between 650 mm and 800 mm.



Figure 1 slum flow Test

#### L-Box Test:

The time it takes to flow a distance of 200 mm (T-20) and 400 mm (T-40) to the horizontal plane and the concrete heights at both ends of the device (H1 & H2) are measured. . The L-Box test can provide an indication of filling capacity and ability to pass.



Figure :-2 L-Box Test

#### V-Funnel Test:

The amount of concrete required is 12 liters and the maximum aggregate diameter of 7 is 20mm. As an empirical test to determine the effect of chemical admixture on the flow of



Figure :- 3 V-funnel Test

Table :-3 result of fresh property of SCC of M40 Grade

Sr no.	Mix Proportion	Slump flow	L-Box	V-Funnel
1	SCC	725	0.92	12
2	4% M.C.	735	0.93	11
3	8% M.C.	755	0.93	10
4	12% M.C.	760	0.94	10
5	16% M.C.	780	0.94	9

Table :-4 result of fresh property of SCC of M40 Grade

Sr no.	Mix Proportion	Slump flow	L-Box	V-Funnel
1	SCC	725	0.92	12
2	4% M.C.	735	0.93	11
3	8% M.C.	755	0.93	10
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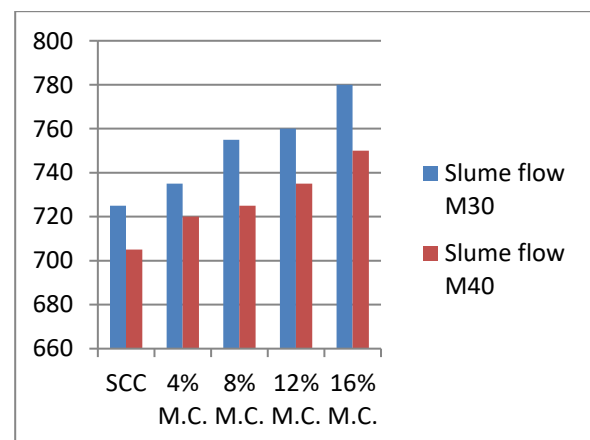


Chart :- 1 Slume Flow

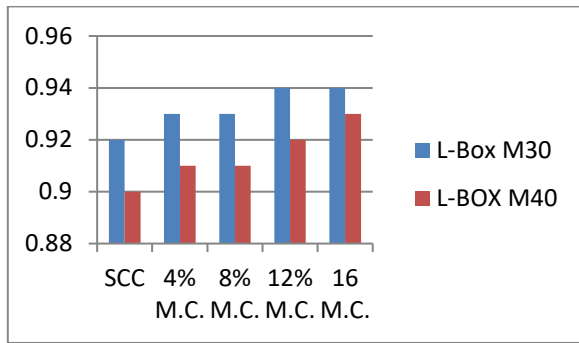


Chart :- 2 L-Box Result

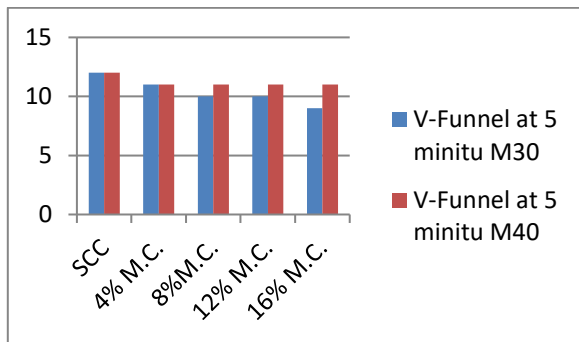


Chart :- 3 V-Funnel

**Compressive Strength:-**

Test results for the compressive test for the M30, and M40 grade with replacement of cement by microsilica powder & magnesium hydroxide will shows results at 3, 7days are as shown below,



Figure:-4 Compressive Strength

Table :-5 result of Compressive strength of SCC of M30 Grade

M30)average compressive strength after			
	3 DAY	7 DAY	28 DAY
SCC	15.65	24.79	41.14
4%M.C.	14.21	22.52	37.45
8%M.C.	14.21	23.64	38.53
12%M.C.	13.26	26.84	44.66
16%M.C.	13.15	30.38	37.29

Table :-6 result of Compressive strength of SCC of M40 Grade

M40average compressive strength after			
	3 DAY	7 DAY	28 DAY
SCC	21.25	30.76	52.26
4%M.C.	20.07	28.82	43.26
8%M.C.	19.43	30.71	45.84
12%M.C.	19.05	33.20	56.06
16%M.C.	18.40	28.65	47.39

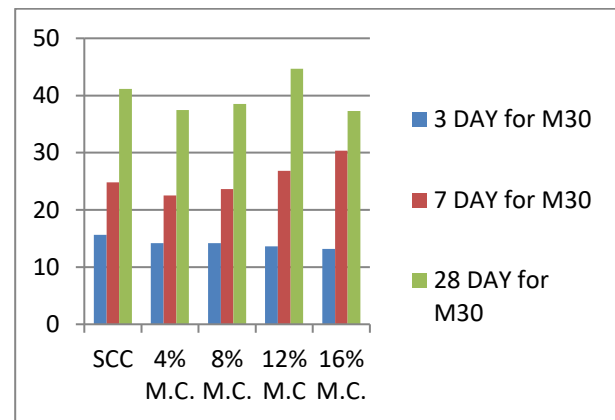


Chart :- 4 Compressive strength Result for M30

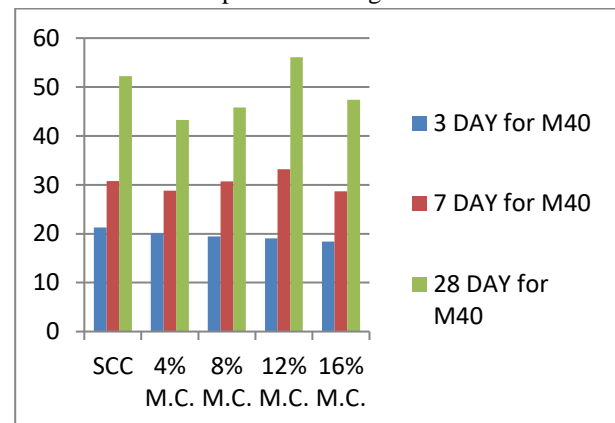


Chart :- 5 Compressive strength Result for M40

**Split tensile strength test:-**

Test results for the split tensile strength test for the M30, and M40 grade with replacement of cement by microsilica powder & magnesium hydroxide will shows results at 3 and 7 days are as shown below,

Table 7: Split Tensile Strength Results for M30 Grade

Sr.no.	Mix	At 28Day(N/MM2)
1	SCC	3.37
2	4% M.C.	3.62
3	8%M.C.	3.9
4	12%M.C.	4.14
5	16%M.C.	4.08

Table 8: Split Tensile Strength Results for M40 Grade

Sr.no.	Mix	At 28Day(N/MM2)
1	SCC	3.87
2	4% M.C.	4.13
3	8%M.C.	4.55
4	12%M.C.	4.94
5	16%M.C.	4.89

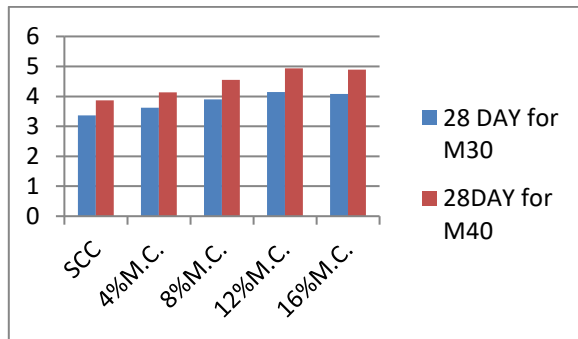


Chart :- 6 split tensile strength Result for M30 &amp; 40 Grade

### Durability Test

Table:-9 SEA Water Attack Result (Strength Loss):-

	28 DAY
SCC	3.08
12%M.C.	2.48

Table:-10 ACID Water Attack Result (Strength loss):-

	28 DAY
SCC	3.17
12%M.C.	2.08

### IV. CONCLUSION

The percentage of microcline powder in the mix will affect the workability Mechanical characteristic of SCC. When dosage of microcline increased the flow will increase. Compressive strength & Split tensile strength of 12% dosage of microcline powder at 28 day is higher. By adding 16% microcline powder flow is maximum for M30 & M40.

### FUTURE SCOPE

SCC is blended with binary mix, one can add ternary mix with addition to replace natural material used in concrete and check chemical properties of concrete. Microscopic structure may analyze, X-ray diffraction may check out. By improving properties of microcline powder one can get higher strength, by controlled burn. More properties like modulus of elasticity may find out, along with chemical analysis of concrete.

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