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Partial Replacement of Fine Aggregate with Foundry Sand in Self Compacted Concrete

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Abstract: This document demonstrates the possibility of using foundry sand waste as a partial replacement of sand in self-compact concrete. Self-compacting concrete, as the name implies, is a type of concrete that does not require an external or internal seal because it is aligned and consolidated under its weight. Foundry sand is a high-quality silica sand that is used as a molding material for the ferrous and non-ferrous metal casting industry. It can be reused in foundries, but after a certain period it cannot be used further and becomes waste, called waste, used or used foundry sand (WFS, UFS or SFS). This experimental study was conducted to assess the strength and strength of SCC properties in which natural sand was partially replaced by foundry sand waste (WFS). Natural sand was replaced by four percent (0%, 10%, 15%, 20%, 30% and 40%) WFS by weight.
Keywords: Compressive strength, concrete and shrinkage

I. INTRODUCTION

Self-compacting concrete, as the name implies, is a type of concrete that does not require external or internal vibrations to accommodate and seal, but it is compacted under its weight. It is able to flow under its own weight, completely filling the formwork and achieving full compaction, even in the presence of overloaded fittings. At the same time, it is cohesive enough to fill spaces of almost any size and shape without segregation or bleeding. This makes SCC especially useful where placement is difficult, for example, in highly reinforced concrete elements or in complex formwork. SCC was first developed in Japan to achieve strong concrete structures in the 1980s.

II. REVIEW OF LITERATURE

Foundry sand is a high-quality silica sand that is used as a molding material for the ferrous and non-ferrous metal casting industry [1,2]. It can be reused in foundries, but after a certain period it cannot be used further and becomes a waste called used or used foundry sand (UFS or SFS). Most used foundry sands are classified as non-hazardous waste (which is not corrosive, inflammatory, reactive or toxic) Siddick and Numove, [3,4]. The foundations use high-quality silica sands for use in their moldings and castings. operations. Raw sand is usually of higher quality than typical bank or natural sand used on construction sites. In the casting process, molding sands are recycled and reused [5,6]. Eventually, the processed sand degrades to the point that it can no longer be used in the casting process. When it is impossible to additionally use sand in foundry production, it is removed from foundry production and called spent foundry sand [7,8].

III. METHODOLOGY

Conventional Portland cement (J.K. Cement, class 43) was used in accordance with the Indian standard specification BIS-8112: 1989 [10]. The sand used for the experimental program was purchased locally and met the Indian standard specifications IS: 383-1970 and belonged to zone II

The work used a locally available coarse unit, maximum size 10 -12 mm. Foundry sand for waste was obtained from a local foundry unit with a specific gravity of 2.43.

The impurity used was an Auramix 400 brand FOSROC. This is an impurity based on polycarbonic ethers. Both units met the requirements of Indian standard IS specifications: 383. The proportion of the thin and coarse unit was 2.57 and 2.65, respectively, while their fineness module was 2.65 and 6.85, respectively.

Foundry sand was used in this work to replace a thin unit by weight. The replacement rate was 0%, 10%, 15%, 20%, 30% and 40%. A constant ratio of w / p .47 was used. To assess the properties of fresh concrete, a flow test, a V-funnel, an L-box and a U-box were performed. To assess the hardened properties of concrete, a test was performed for compressive strength, tensile strength, sulfate resistance and fast chloride permeability test.

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IV. RESULTS

From the experiment carried out on M30 grade of self compacting concrete with foundry sand following results are obtained:

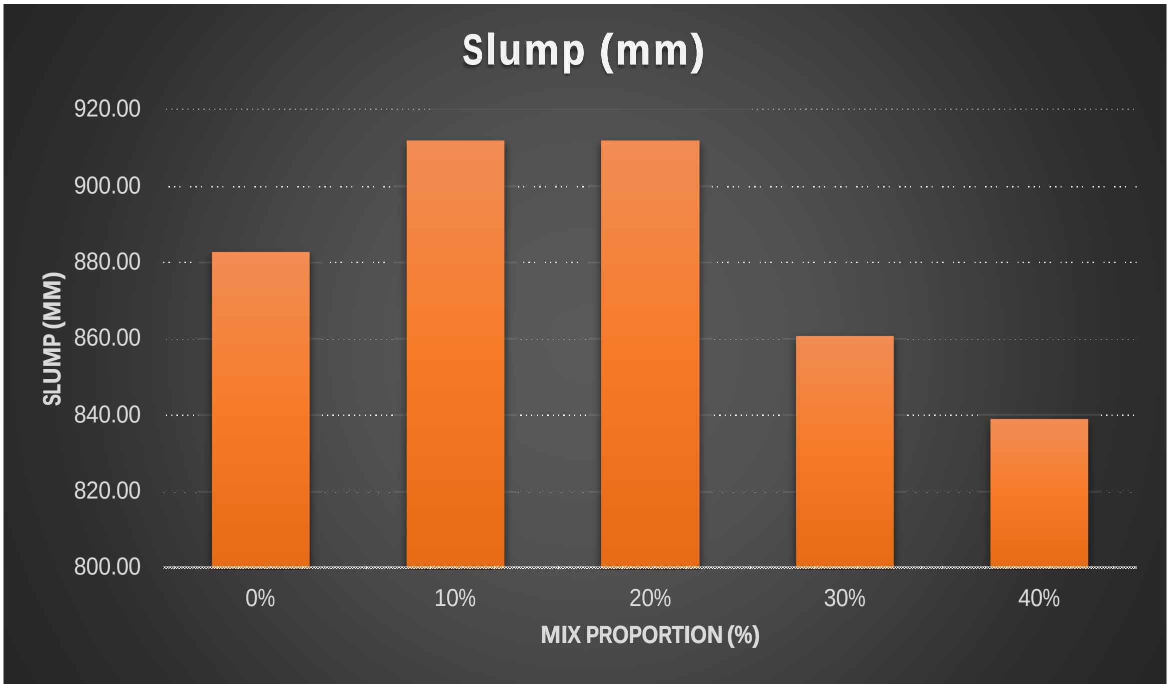

Fig.1: Slump for all the mix proportions in the concrete

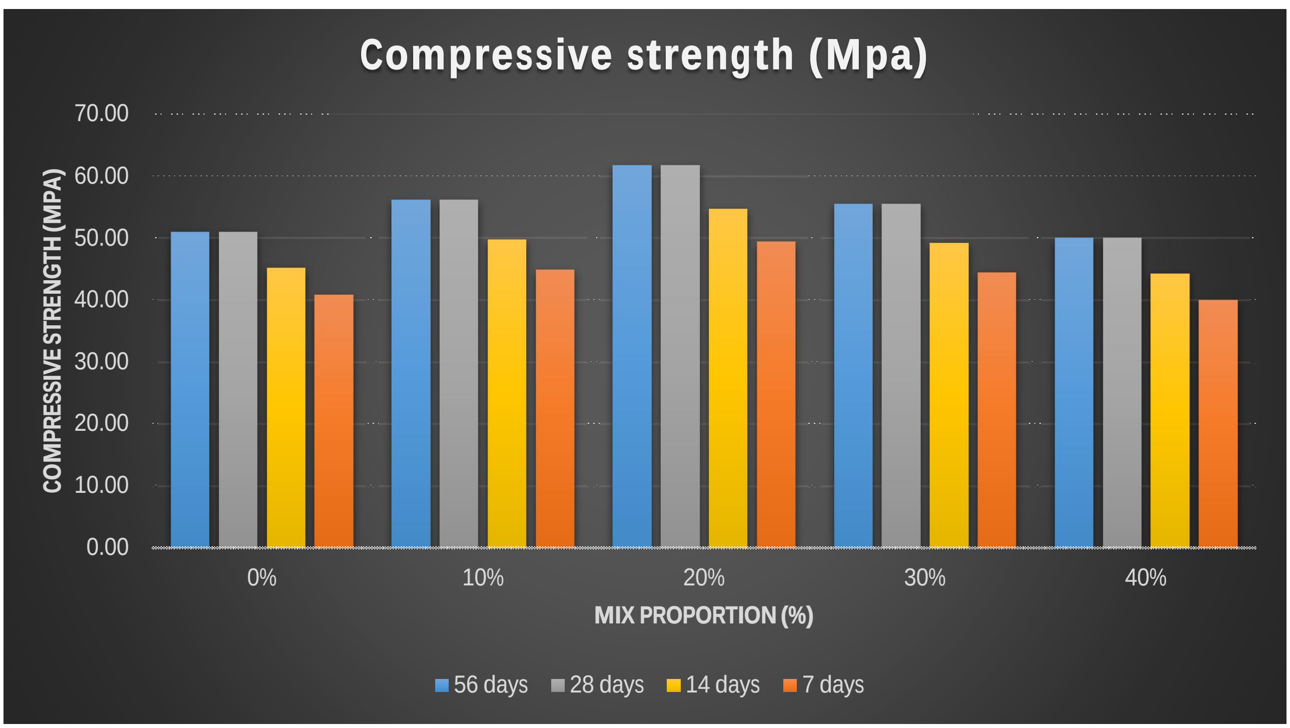

Fig.2: Compressive strength (Mpa) for all the mix proportions in the concrete

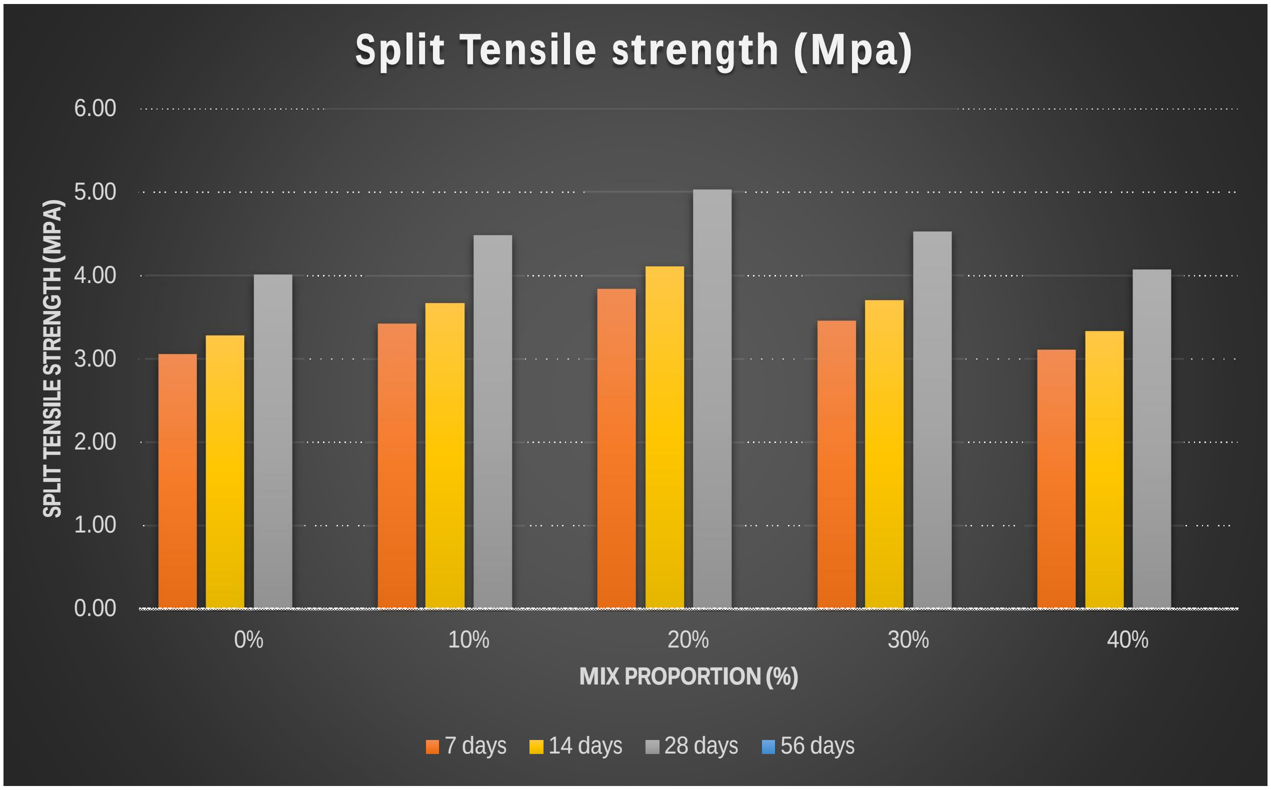

Fig.3: Split Tensile strength (Mpa) for all the mix proportions in the concrete

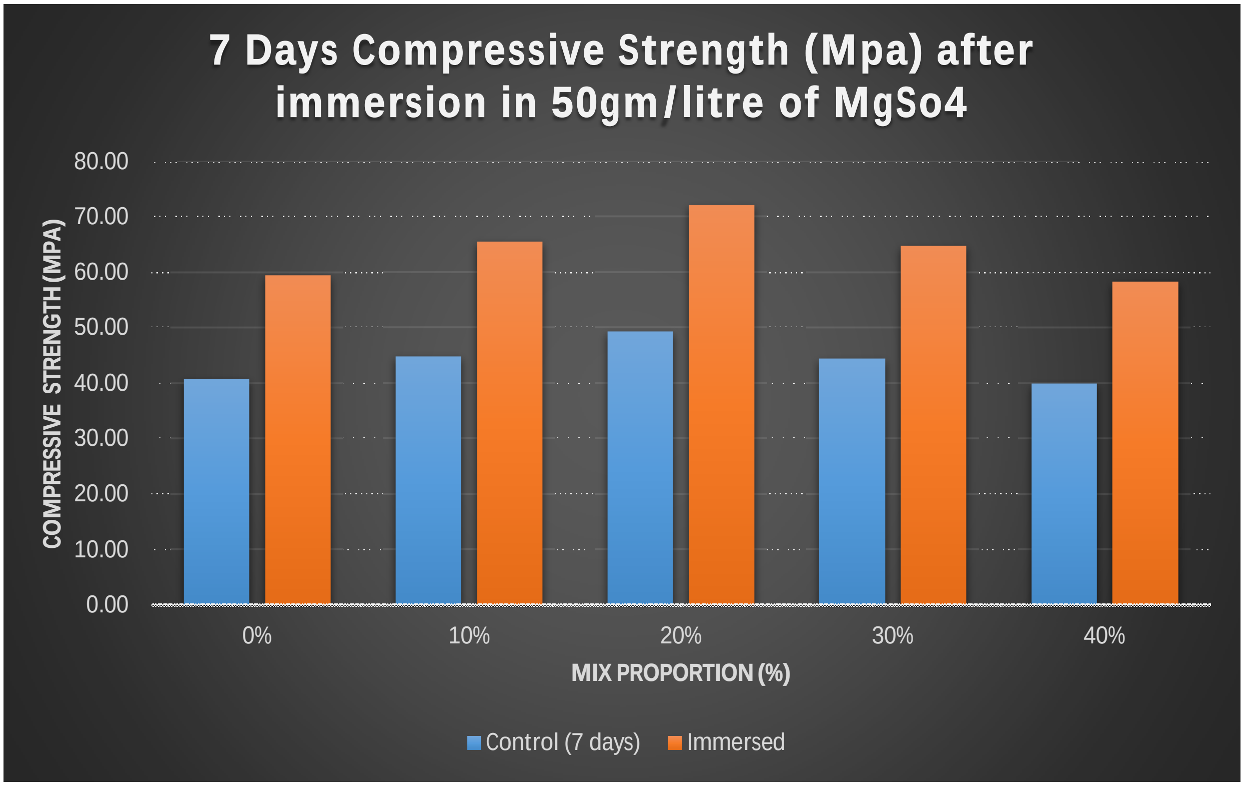

Fig.4: 7 Days Compressive Strength (Mpa) after immersion in 50gm/litre of MgSo4 for all the mix proportions in the concrete

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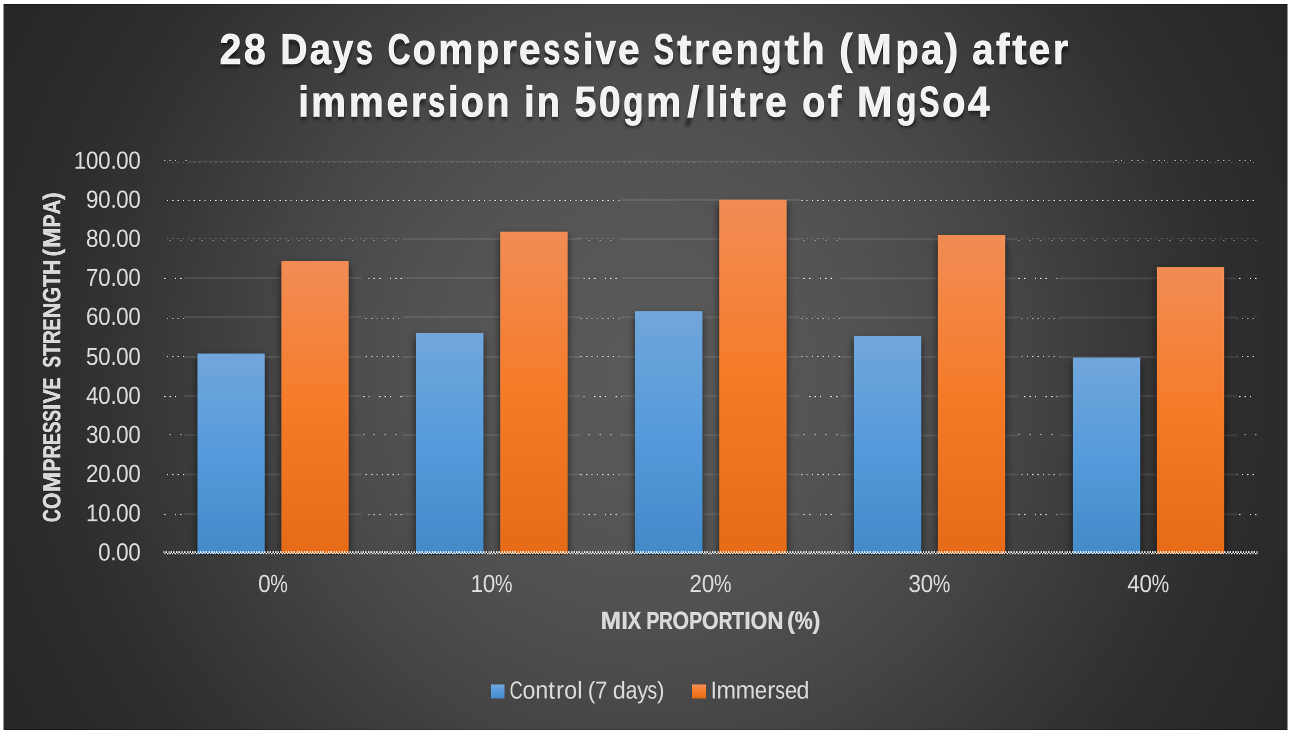

Fig.5: 28 Days Compressive Strength (Mpa) after immersion in 50gm/litre of MgSo4 for all the mix proportions in the concrete

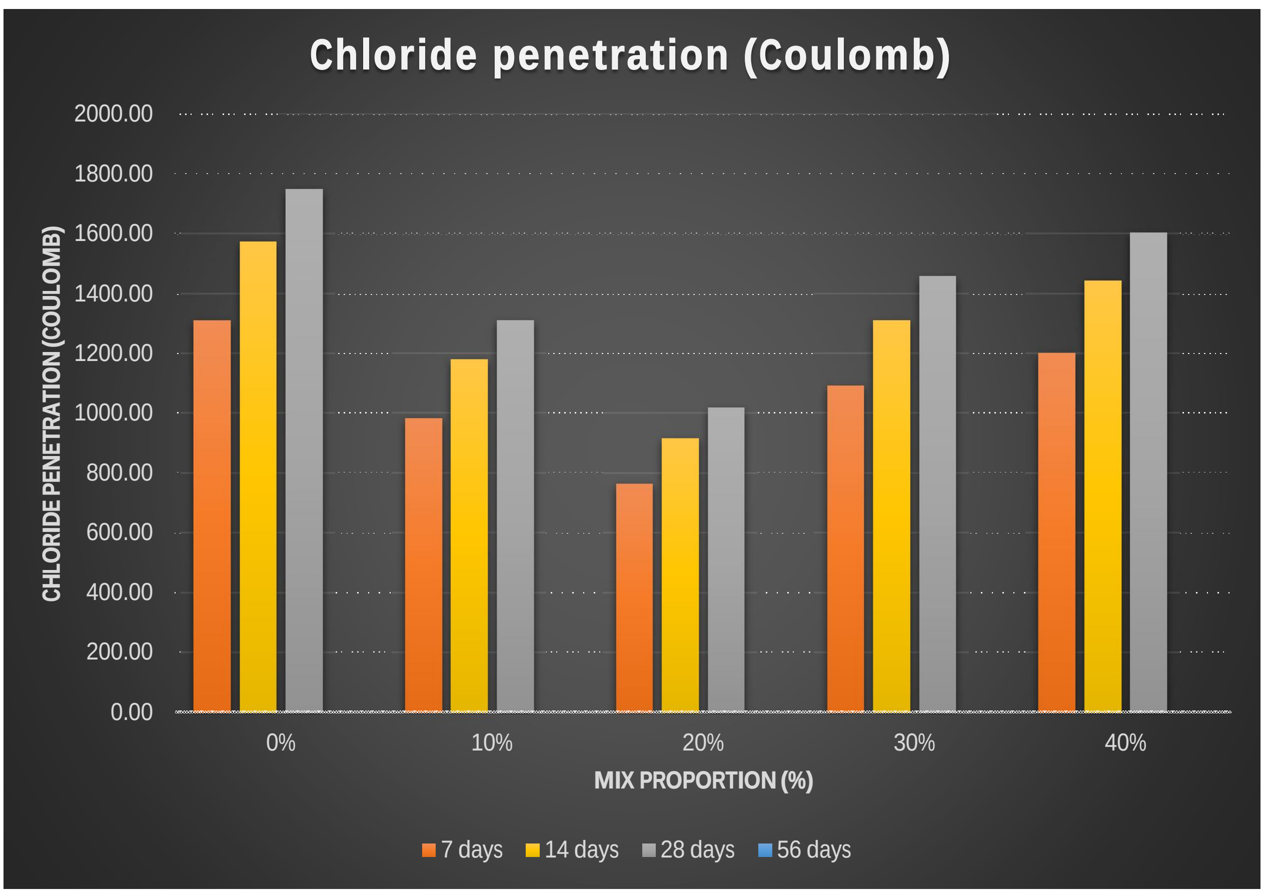

Fig.5: Chloride penetration (Coulomb) for all the mix proportions in the concrete

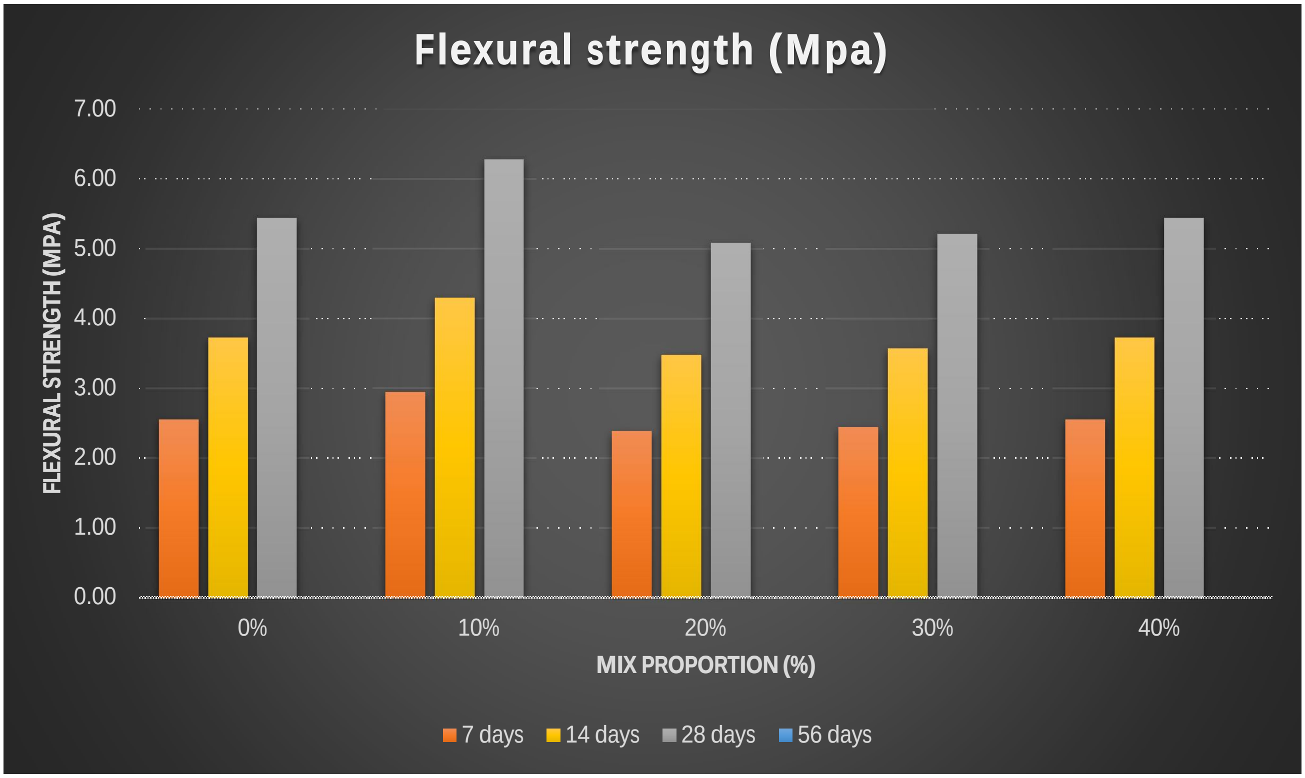

Fig.6: Flexural strength (Mpa) for all the mix proportions in the concrete

V. CONCLUSION

The conclusions from the above study are as follows:

A. The The Slump for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.
B. Compressive strength (Mpa) for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.
C. Split Tensile strength (Mpa) for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.
D. 7 Days Compressive Strength (Mpa) after immersion in 50gm/litre of MgSo4 for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.
E. 28 Days Compressive Strength (Mpa) after immersion in 50gm/litre of MgSo4 for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.
F. Chloride penetration (Coulomb) for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.
G. Flexural strength (Mpa) for all the mix proportions in the concrete is found to be maximum for the case of 20% mix proportion of SCC.

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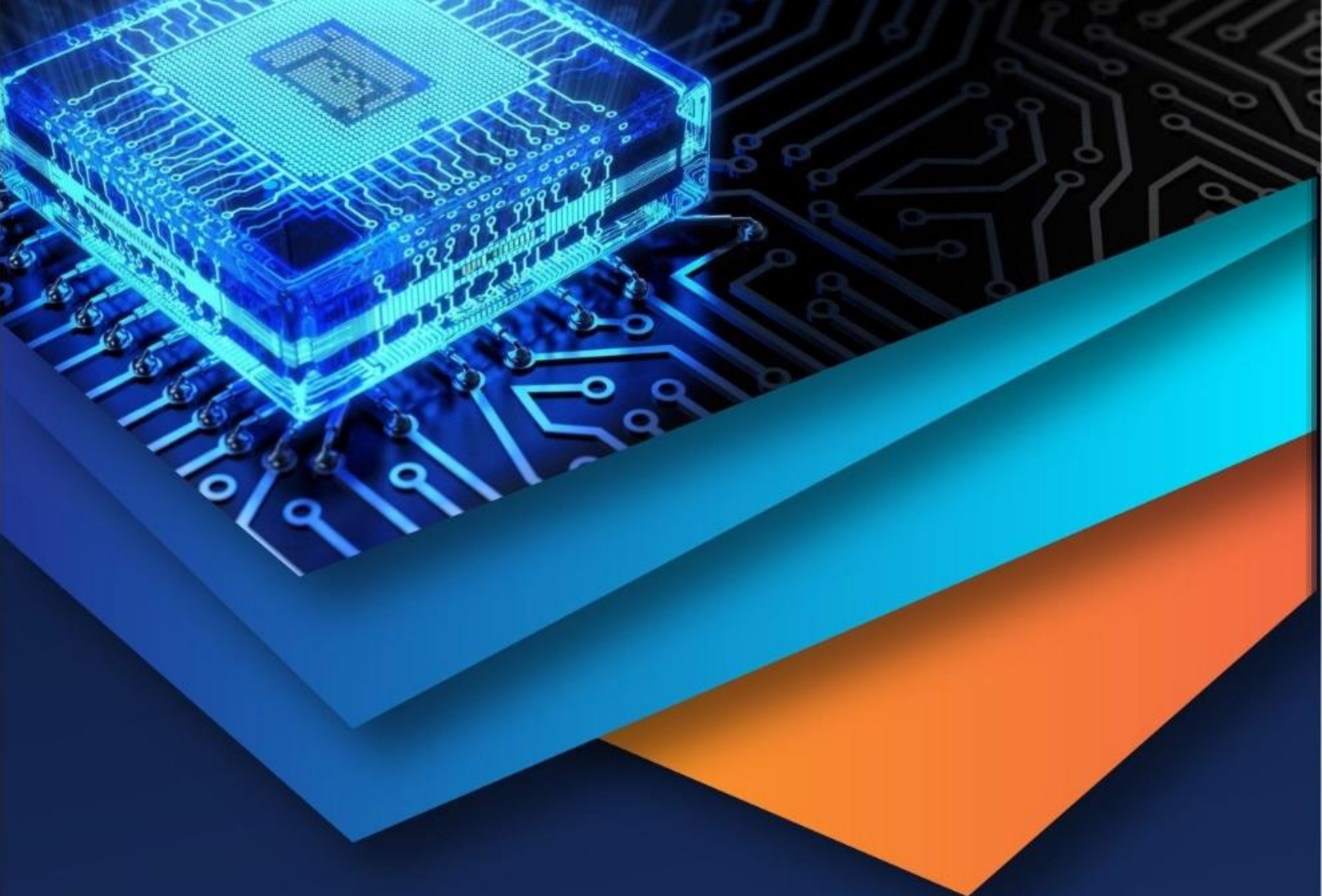

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