iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IX **Month of publication:** September 2022

DOI: https://doi.org/10.22214/ijraset.2022.46705

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IX Sep 2022- Available at www.ijraset.com

Enhancing Property of Concrete Using Styrene Butadiene Rubber (SBR) Latex with Waste Ceramic Tile Powder

Shubham Kulsheshta[1], Rajnish[2]
[1]M.Tech student, Department of Civil Engineering, Lucknow Institute of Technology, Lucknow
[2]Head of Department Civil, Department of Civil Engineering, Lucknow Institute of Technology, Lucknow

Abstract: The cement Concrete is a mixture of cement, water, sand, pebbles, or crushed rocks (the aggregate or fillers), which when used to build structures and then allowed to cure, hardens into stone. Water, aggregate, and cement are the three main ingredients. Plastic and polymer are the least priced materials as compared to steel and are widely accessible. One of the three main manufacturers of carbon dioxide, a significant greenhouse gas, is the cement industry. Its contribution to the global human CO2 emissions as of 2011 is 7%, primarily as a result of the sintering of clay and limestone at 1500^0 C. Because Styrene Butadiene Rubber (SBR) latex emulsions have advantages in terms of flexure strength, compressive strength, adhesion, and impermeability, they are increasingly used in the construction and repair of concrete. When used in a certain ratio between old and new concrete layers, SBR emulsion can increase the compressive and flexural strength of concrete members. There is demand on the ceramic industries to find a solution for the disposal of the growing amount of ceramic waste. Therefore, using ceramic waste powder in many industrial sectors, particularly the building industry, would aid in environmental protection. Consequently, the use of eco-friendly concrete has increased. Concrete can be made more environmentally friendly by using waste ceramic tile powder as a partial replacement for cement. Thus, the goal of this study is to develop an affordable and environmentally friendly concrete replacement using waste ceramic tile powder and SBR latex.

Keywords: Styrene Butadiene rubber latex, Waste ceramic tile powder , eco-friendly concrete.

I. INTRODUCTION

Concrete is a composite material made of coarse granular material (the aggregate or filler) that is encased in a stiff matrix of material (the cement or binder) that fills the gaps and holds the aggregate particles together. Concrete can alternatively be thought of as a composite material made mostly of a binding medium with embedded aggregate particles or fragments. Concrete can be simplest represented as follows:

concrete = Binder + Filler

Concrete made using Portland cement, asphalt, and epoxy are a few examples. Portland cement concrete is most frequently used in concrete construction. As a result, when we speak to concrete in our course, we usually mean Portland cement concrete. The composition for this type of concrete can be described as follows:

coarse aggregate + fine aggregate + cement + water+ admixture→ concrete

Here, we should point out that admixtures are nearly always employed in contemporary practice and have subsequently evolved into a necessary element of contemporary concrete. Admixtures are substances added to a batch of concrete either immediately before or during mixing that are not aggregate (fine and coarse), water, fibre, or cement. The numerous advantages made available by the use of admixtures are primarily responsible for their widespread adoption. Styrene butadiene rubber (SBR) latex used as substitute of cement.

A. Styrene Butadiene Rubber (SBR) Latex

A copolymer of styrene and butadiene is used to create the all-purpose synthetic rubber known as styrene-butadiene rubber (SBR). The composition of SBR is roughly 75% butadiene (CH2=CH-CH=CH2) and 25% styrene (CH2=CHC6H5). Most often, during an emulsion process, these two chemicals are copolymerized (their single-unit molecules are connected to form lengthy, multiple-unit molecules. SBR is a product of synthetic rubber research that took place in Europe and the United States under the impetus of natural rubber shortages during World Wars I and II.

By 1929 German chemists had developed a series of synthetic elastomers by copolymerizing two compounds in the presence of a catalyst. This series was called Buna, after butadiene, one of the copolymers, and sodium, the polymerization catalyst. During World War II the United States, cut off from its East Asian supplies of natural rubber, developed a number of synthetics, including a copolymer of butadiene and styrene.

B. Ceramic Tile Powder

There is demand on the ceramic industries to find a solution for the disposal of the growing amount of ceramic waste. Therefore, using ceramic waste powder in many industrial sectors, particularly the building industry, would aid in environmental protection. Consequently, the use of eco-friendly concrete has increased. Ceramic trash has Pozzolanic characteristics and is regarded as non-hazardous solid waste. Therefore, recycled materials can be used again in a variety of building construction applications. Up to 35% of the aggregate in concrete mixes is typically made up of industrial wastes that are coarser than cement particles.

II. OBJECTIVE

A. To examine how the addition of Styrene Butadiene Rubber (SBR) latex to waste ceramic tile powder affects concrete's compressive strength, flexural strength, and workability.
B. To determine the ideal ratio of discarded ceramic tile powder to styrene butadiene rubber latex for the optimum concrete mix.
C. To investigate new materials as potential replacements for existing ones in order to produce more affordable and environmentally friendly concrete.

III. METHEDOLOGY

A. Before initiating the job, a variety of literature reviews were conducted to better grasp the topic.
B. Specific tests on the materials utilised in the dissertation work were conducted to determine their specifications and quality.
C. Using IS 10262-2009, the mix design for M25 grade concrete was completed.
D. After 28 days, the compressive and flexural strength of the prepared and mixed M25 grade concrete was tested.

IV. MATERIALS USED

A. Ordinary Portland cement
B. Fine aggregate
C. Coarse aggregate
D. Admixtures
E. Styrene Butadiene Rubber (SBR) Latex
F. Waste ceramic tile powder

V. TESTS

A. Cement

- Setting time of the cement
- Compressive strength of cement

B. Tests On Aggregates

- Sieve analysis of fine aggregate
- Sieve analysis of coarse aggregate

C. Tests On Concrete

- Slump test
- Compressive strength test of concrete
- Flexural strength test concrete.

D. Tests On Waste Ceramic Tile Powder

- Specific gravity of ceramic tile powder
- specific gravity of coarse aggregate

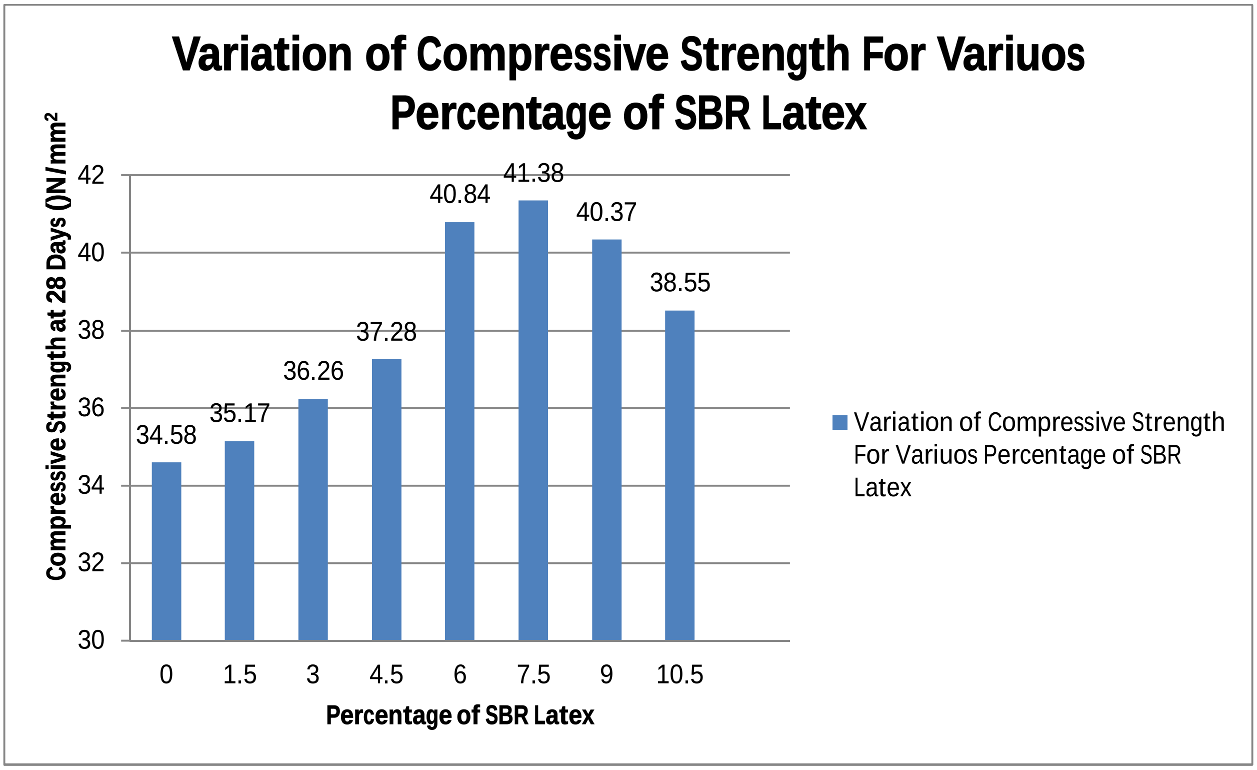
International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IX Sep 2022- Available at www.ijraset.com

VI. RESULTS

A. Compressive Test Results

1) For Compressive Strength at various percentage of SBR Latex and 0% ceramic powder

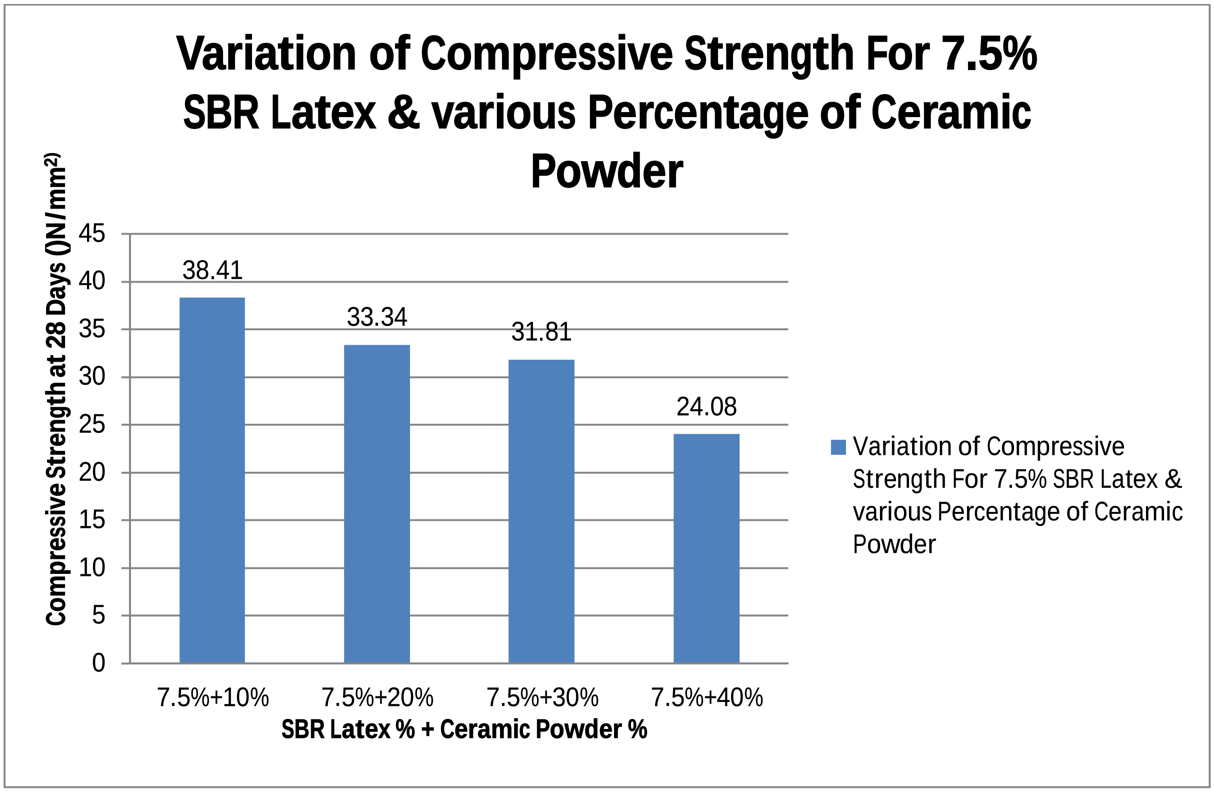
Sr. no	SBR latex percentage	Compressive strength at 28 days (N/mm^2)
1.	0	34.58
2.	1.5	35.17
3.	3.0	36.26
4.	4.5	37.28
5.	6.0	40.84
6.	7.5	41.38
7.	9.0	40.37
8.	10.5	38.55



Graph For Compressive Strength at Various % of SBR Latex

2) For Compressive Strength at 7.5% SBR Latex and various Percentage of Ceramic Powder

7.5% SBR Latex & Ceramic Powder Percentage	Compressive Strength at 28 Days (N/mm^2)
10	38.41
20	33.34
30	31.81
40	24.08



Graph For Compressive Strength at 7.5% SBR Latex & various % of ceramic powder

VII. CONCLUSION

In the present study, the mechanical properties of three types of concrete namely plain concrete, latex modified concrete and latex modified ceramic tile powder reinforced concrete has been determined on the basis of various test results carried out in laboratory. Based on these results and observations made in this experimental research study, the following conclusions are drawn:-

1) At 0% SBR latex and 0% ceramic the compressive strength is seen to be 34.58 N/mm^2 after 28 days.
2) At 7.5% SBR latex and 0% ceramic the compressive strength is seen to be 41.38 N/mm^2 maximum from all the results.
3) It is seen that as we increase the percentage of SBR at 0% ceramic the compressive strength of the concrete starts to decrease.
4) At 7.5% SBR latex and various percentage of ceramic powder the compressive strength is calculated.
5) At 7.5% SBR latex and 10% ceramic powder compressive strength is seen to be maximum.
6) As we increase the percentage of ceramic powder the compressive strength of concrete decreases thus specific percentage of ceramic powder is used.

REFERENCES

[1] Dr. Mahdi Saleh Ess and Nada Flah Hassan, Effect of Adding Styrene Butadiene Rubber Admixture (SBR) on Concrete Properties and Bond Between Old and New Concrete, Kerbala University Journal, 2008.
[2] Veera Reddy, M., "Investigations on Stone Dust and Ceramic Scrap as Aggregate Replacement in Concrete," International Journal of Civil and Structural Engineering, 2010, 2010.
[3] DR. T. Sekar, N. Ganeshan, and DR. NVN.Nampoothiri conduct research on the strength characteristics of waste materials used as coarse aggregate in concrete. Engineering Science and Technology International 2011.
[4] Dr. Vaishali Ghorpade, Sri K Munirathnam, and Dr.H Sudarsana Rao Natural rubber latex's effect on the strength and workability of fibre reinforced high-performance concrete with metakaolin admixture, Engineering Research and Applications International Journal, 2013
[5] Amitkumar D. Raval, Indrajit N. Patel, and Jayesh kumar Pitroda International Journal of Innovative Technology and Exploring Engineering, 2013, Eco-Efficient Concretes: Use Of Ceramic Powder As A Partial Replacement Of Cement,
[6] Prof. G. N. Shete1, Prof. K. S. Upase, Evaluation of Compressive Strength and Water Absorption of Styrene Butadiene Rubber (SBR) Latex Modified Concrete, International Journal Of Modern Engineering Research, 2014.
[7] M. S. Shobha, Dr. C. Shashidhar, Dr. H. Sudarsana Rao. Strength Studies Of Natural Rubber Latex Modified High Performance Concrete, International Journal of Engineering Research & Technology 2013.
[8] Ms. Karthika Kishore Koka, Mr. Shashi Kumara S R, Dr. D L Venkatesh Babu, Steel Fibre Reinforced Latex Modified Concrete, International Journal of Engineering Research & Technology,2014.