Dr. Gowhar Afzal

Assistant Professor (Structural Engineering)
Department of Architecture
Islamic University of science and Technology, Kashmir, India -192122

Former Research Scholar
National Institute of Technology Srinagar
Jammu and Kashmir, India -190006

Mob: 91-8825054660

DOB: 7th May 1993

Email: - gowhar_11phd19@nitsri.ac.in , gowharafzal841@gamil.com

Google scholar: - https://scholar.google.com/citations?user=juT_f0UAAAAJ&hl=en

Research gate: - https://www.researchgate.net/profile/Gowhar-Afzal-2

ORCID: - https://orcid.org/ 0000-0002-6760-4744

RESEARCH INTERESTS

- Sustainable Concrete Composites
- Graphene Oxide From Waste Biomass for sustainable pavement construction
- Pervious concrete a green and environmental friendly material (Mechanical, Durability and Microstructural aspects)

EDUCATION

Year	Qualification / Courses	CGPA/Percentage	Department / University
2025	**Ph.D.** Title:- Experimental Study on Performance of Sustainable Pervious Concrete Incorporated with Graphene Oxide. Advisor:- Dr. T. R. Dar	**9.6**	**Faculty of Engineering** **National Institute of Technology Srinagar, India**
2018	**M. Tech Structural Engineering** Project: - Experimental study on Strength and Permeability of Pervious Concrete. Advisor: - Dr. Kanish Kapoor	**9.14**	**Department of Civil Engineering** **Lovely Professional University, India**
2016	**B. Tech Civil Engineering** Main courses:- Composite materials, Structural analysis, waste water management, environmental engineering, water resource and irrigation, soil and fluid mechanics, disaster and waste management etc.	**8.38**	**Department of Civil Engineering** **Lovely Professional University, India**
2010	**Senior Secondary School** Subjects:- Physics, Chemistry, Information Technology, Mathematics, English	**75%**	**New Greenland Senior secondary school, Srinagar, India**

PATENT/PUBLICATIONS/BOOKS/CONFRENCES

Patents

Patent application No.\Patent No.	Title of Invention	Publication Date	Status/Grant date
201811008145A /362806	A DEVICE FOR MEASURING THE INFILTRATION RATE OF WATER THROUGH PERVIOUS CONCRETE	16/03/2018	Granted on 06/03/2021
473779-001	CROP STATISTICS ANALYSING COMPUTING PAD	16/09/2025	Granted on 11/12/2025

Referred Journal papers/Books/Chapters

Title of the journal /Book	Title of the Research paper	Vol No, Page No, Year, ISSN/ISBN	Authors	Indexed/non Indexed
Road materials and pavement design	Innovative pavement composite using graphene oxide in pervious concrete: durability performance analysis	1–36 (2025)	Gowhar Afzal* Tanveer Rasool	Q1, Scopus/SCI
International Journal of Pavement Engineering	Sustainable Pervious Concrete Incorporated with Graphene Oxide: A Comprehensive Analysis of Mechanical, Infiltration and Microstructure Performance	25(1):2335309 (2024)	Gowhar Afzal* Tanveer Rasool	Q1, Scopus/SCI
Bioresource technology reports	Green synthesis of graphene oxide from invasive plant species (Nymphaeaceae) for enhancing cement paste microstructure and compressive strength	28-102005 (2024)	Gowhar Afzal* Tanveer Rasool	Q1, Scopus/SCI
Innovative Infrastructure solutions	Exploring the impact of nano-limestone cementitious material on mechanical, infiltration, and microstructure properties of pervious concrete	9,63 (2024)	Gowhar Afzal* Tanveer Rasool	Q2, Scopus/SCI
Sustainable Engineering	Experimental Study of Pervious concrete And Artificial Clogging	90, 29-39 (2021)	Gowhar Afzal* Kanish Kapoor Mudasir Nazeer SP Singh	Scopus
Sustainable Engineering	Experimental Study on Infiltration properties of Pervious concrete	30, 367-373 (2019)	Gowhar Afzal* Kanish Kapoor Tanveer Ahmad Dar	Scopus

Conference	Title of The Paper	Authors	National/International	Place
Advances in construction Materials And structures-2018	Study The Permeability of Pervious concrete with different Mix Proportion made With Recycled Coarse Aggregates	Gowhar Afzal Tanveer Ahmad Kanish Kapoor	International	IIT Roorkee, India
EGRWSE-2018	Experimental Study on Infiltration properties of Pervious concrete	Gowhar Afzal Tanveer Ahmad Kanish Kapoor	International	NIT Jalandhar
Advances in construction Materials And structures-2018	Study The Properties of Porous Concrete by Addition of waste Plastic as coarse aggregates	Gowhar Afzal Tanveer Ahmad Kanish Kapoor	International	IIT Roorkee, India
Advances in construction Materials And structures-2018	Study the permeability of Porous Concrete	Gowhar Afzal Firdous Ahmad Dar Kanish Kapoor	International	IIT Roorkee, India
EGRWSE-2019	Experimental Study of Pervious concrete And Artificial Clogging	Gowhar Afzal Kanish Kapoor Mudasir Nazeer SP Singh	International	Chicago, USA
ACMS-2022	Nano-Limestone incorporated Cementitious material: A critical study on Strength and Durability properties of Pervious Concrete	Gowhar Afzal Tanveer Rasool	International	Kolkata, India
ICECEES-2024	Green Synthesis of Graphene Oxide from Invasive plant species (Nymphaeaceae): A Sustainable Approach	Gowhar Afzal Tanveer Rasool	International	IIT Roorkee, India

Reviewer Work

Journal Name	Publisher	Review identifier	Indexing
Journal of building engineering	Elsevier	SOURCE-WORK-ID: f70619e6-add9-4667-a2fe-e19bdaa52871	Scopus/SCI
Journal of building engineering	Elsevier	SOURCE-WORK-ID: 3e8f94fe-bb23-4eb2-8eb535c27e850662	Scopus/SCI
Journal of building engineering	Elsevier	SOURCE-WORK-ID: f0389733-e579-438e-88e67357878195ab	Scopus/SCI
Innovative infrastructure solutions	Springer Nature	IISS-D-23-01124R1	Scopus/SCI
Innovative infrastructure solutions	Springer Nature	IISS-D-23-01124	Scopus/SCI
Journal of cleaner production	Elsevier	JCLEPRO-D-24-09305	Scopus/SCI

PhD

Title "Experimental Study on Performance of Sustainable Pervious Concrete Incorporated with Graphene Oxide".

Abstract

This research presents a detailed and systematic investigation into the development of durable, high-performance, and sustainable pervious concrete (PC) for pavement applications by incorporating nanomaterials, nano-limestone (NL) and graphene oxide (GO). The study addresses the critical limitations of conventional PC in terms of mechanical performance and durability under demanding environmental conditions, while maintaining sufficient permeability as per the standards specified by ACI 522R-10.

In the first phase, nano-limestone was prepared via laboratory-scale ball milling using locally available limestone and was partially used to replace cement at varying dosages (1%, 2%, 3%, and 4% by weight of cement). The results revealed that a 2% replacement of NL yielded optimal performance, with compressive strength improving to 24.29 MPa at 28 days and 12.12 MPa at 3 days, marking a 19.2% and 48.2% increase respectively over control mixes. Splitting tensile strength increased to 3.12 MPa at 28 days (58.6% improvement), and shear strength reached 3.75 MPa (26.4% increase). However, permeability declined significantly beyond 2% NL, with PC becoming nearly impermeable at 4% replacement. A threshold infiltration rate of 2.43 mm/s was maintained at 2% NL, suggesting it as the optimal dosage to balance strength and infiltration.

The second phase focused on the sustainable synthesis of GO from two sources graphite flakes and locally abundant *Nymphaeaceae* biomass using a modified Hummers method. The synthesized GO was characterized using multiple techniques. SEM imaging revealed the layered morphology of GO sheets; FT-IR spectra confirmed the presence of oxygen-functional groups; XRD displayed characteristic peaks of oxidized graphite; Raman spectra revealed prominent D and G bands; UV analysis showed absorption peaks typical of GO, and contact angle measurements indicated its hydrophilic nature. These results confirmed the successful production of GO with desirable physicochemical properties using an environmentally friendly approach.

In the third phase, synthesized GO was incorporated into pervious concrete at six dosages (0%, 0.02%, 0.04%, 0.06%, 0.08%, and 0.1% by cement weight) to study its impact on mechanical strength, infiltration rate, and microstructure. The 0.1% GO mix exhibited the highest mechanical performance with compressive strength reaching 31.03 MPa at 28 days and 32.89 MPa at 56 days an increase of 52.1% and 57% respectively. Splitting tensile strength improved to 3.9 MPa at 56 days, while shear strength reached 5.12 MPa. Although the infiltration rate showed an 11.67% reduction at 0.1% GO, it remained within the acceptable range of ACI 522R-10. Microstructural analysis using FE-SEM, XRD, FT-IR, and EDS indicated denser matrices with well-formed and symmetrically aligned C-S-H gel structures, affirming the nanofiller effect and enhanced hydration.

The final phase involved the evaluation of the durability of GO-modified pervious concrete under harsh environmental and operational conditions with varying aggregate proportion and using two different cement-to-aggregate (c/a) ratios (1:4 and 1:5). Parameters including freeze-thaw resistance, abrasion, ravelling, fire resistance, and clogging potential were assessed. The GO-modified mix (0.1%) showed mass loss below 5% and compressive strength loss below 20% after freeze-thaw cycles, satisfying ASTM C666/C666M - 03 (2008) requirements. Ravelling loss reduced from 35% (control) to 24.1% after 500 cycles. Abrasion loss dropped from 4.5 mm to 1.08 mm (a 76% reduction), and fire-induced mass loss at 600°C reduced from 5.9% to 2.7%. The optimized GO mix achieved compressive strengths of 17.05 MPa, 31.83 MPa, 34.4 MPa, and 36.15 MPa at 7, 28, 56, and 120 days, respectively. Porosity across all mixes ranged from 15% to 19.6%, and infiltration rates between 3.6 and 8.2 mm/s met ACI 522R-10 criteria. GO also improved clogging resistance, with complete clogging delayed until the 8th cycle compared to earlier clogging in unmodified mixes. Microstructural evaluations confirmed dense C-S-H and C-H gel formation, contributing to enhanced durability and mechanical integrity.

In conclusion, this thesis establishes a nanomaterial-integrated approach to pervious concrete design. While nano-limestone contributed to early-age strength and matrix densification, it was the incorporation of GO particularly at 0.1 wt% that offered significant improvements across strength, infiltration, microstructural uniformity, and long-term durability. With an Economic Index (EI) value of 0.0054, GO-modified PC is not only structurally and environmentally superior but also cost-effective, providing a sustainable and high-performance solution for next-generation infrastructure, especially in pavement applications exposed to aggressive service environments.

Work Experience

- Assistant Professor (Structural Engineering), Department of Architecture Islamic University of science and Technology, Kashmir, India -192122, (April 2026-present).
- Assistant professor at Govt. collage of engineering and technology-Kashmir, for the period of three months.
- Assistant professor at GNIEM-Hoshiarpur Punjab, from the period of 01-08-2018 to 31-01-2019.

M. Tech Project

Experimental study on Strength and Permeability of Pervious Concrete
My main focus was to design my own instrument for checking the infiltration properties of the pervious concrete, and to check the sediment effect on low and high porosity pervious concrete and effect of clogging on its infiltration properties.

B. Tech Final Year Training

Training on Project site

Objective

The total project cost for construction of proposed 4-lane flyover + 8-lane widening of sub-project stretch has been worked out to Rs. 255.507 Corers. The total length of flyover proposed from Jahangir Chowk to Rambagh Srinagar J&k. This Project includes construction of flyover, retaining wall, subways, drain and utility duct.

Project Highlights

Supervise these all tests at site plate load test, compression strength test, slump cone test and Pile load test.

SKILLSET

IT

- Software's:- STADD. Pro, AUTOCADD, Qgis, Microsoft Office
- Language: - C, C^{++}
- Database:- SQL
- Bridge and Building Design via various software

Laboratory skills

Competently perform routine analytical test procedures and operate standard analytical instruments such as:

- FT-IR
- Muffle Furnace (Fire resistance)
- UV-Vis Spectrophotometer
- BET Analyzer
- CTM
- Vacate Apparatus
- Loss Angels abrasion apparatus

INTERNSHIP

One Month Internship at JK ERA, Kashmir, India

Construction of Flyover from Jahangir Chowk to Rambagh Srinagar J&k.Studied about pile construction, Concrete mix designing, Placing, finishing and Testing on site.

WORSHOPS/SEMINARS ATTENDED

1. "Bridge Design Workshop", Bridge organization, March 2014
2. Recent Trends in Sustainable and Green Technology (RTSGT-20220), IICHE Student Chapter NIT Srinagar 28-06-2022 to 02-07-2022.