



Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

Summary of Research Projects

| S.No. | Title of the R&D Project or Research Grant | Sanctioning Agency, and Date of Sanction | Names of the Principal and Co-Investigators | Total Sanctioned Amount Rs. | Status of the Project (Completed/Ongoing) |
|-------|--|--|---|-----------------------------|--|
| 1. | Reactive Powder Concrete for Structural Applications: Characterization and Performance Evaluation | SERB Scheme: Core Research Grant | Dr. V Srinivasa Reddy (Co-PI) | 15,56,500 | Accepted for Evaluation on 16 th May 2023 |
| 2. | Modernization & Removal Of Obsolescence | AICTE | Dr. GVV Satyanarayana | 9,08,010 | Completed 1 yr (2019-2020) |
| 3. | Microbially Induced Calcite Precipitation for Crack Remediation in Concrete Structures | JNTUH TEQIP III | Dr. V Srinivasa Reddy | 2,99,000 | Completed 1 yr (2019-2020) |
| 4. | Characterization And Performance Evaluation Of Ultra-High Strength Steel Fibre Reinforced Reactive Powder Concrete For Structural Applications | NCC Ltd | Dr. V Srinivasa Reddy Dr K Satyanarayana | 7,50,000 | Ongoing 5 yr (2019-2024) |
| 5. | Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST) Program | DST | Dr J Praveen and Dr V Mallikarjuna Reddy | 99,00,000 | Ongoing 5 yr (2018-2023) |
| 6. | Rehabilitation of Concrete with Bacteria (Bacterial Concrete) | Pachayat Raj, Kandukur, Andhra Pradesh | Dr. V Srinivasa Reddy | 2,00,000 | Completed 2 yr (2017-2019) |
| 7. | Studies on the properties of nano-silica based self-compacting concrete | LANCO Technology Park | Dr. V Srinivasa Reddy | 1,00,000 | Completed 2 yr (2017-2019) |

Total Received funds= Rs. 1,21,57,010/-

Title of the project:

MICROBIALLY INDUCED CALCITE PRECIPITATION FOR CRACK REMEDIATION IN CONCRETE STRUCTURE

Funding Agency: JNTUH TEQIP III

Principal Investigator:

Dr V Srinivasa Reddy, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad
Co. PIs:

1. Dr Ch Sasikala, Centre for Environment, IST, JNTUH
2. Dr S Shrihari, Vidya Jyothi Institute of Technology, Hyderabad

Date of commencement: 22/07/2019

Grant: 2.99 Lakhs **Duration:** 1 Year

Date of completion: 23/02/2021

Objectives as Proposed:

1. Isolation of spore-forming alkaliphilic calcite precipitating bacteria
2. Application of calcite forming bacteria in bio-concrete and evaluating crack remediation capabilities.

Project Outcomes

1. Thirty-one (31) different bacterial strains consisting of both chemotrophic and anoxygenic phototrophic bacteria were cultivated.
2. Screening of selected isolates by mortar cubes compressive strength test shows that *Rhodovulum viride* JA756 and *Sporosarcina pasteurii* has potential to precipitate calcite mineral optimally to give the concrete a dense microstructure.
3. Bacteriogenic mineral precipitation, contributed to the bonding and regaining of strength of the already cracked specimens. This strength recovery can be attributed to chemical bonding between CaCO₃ precipitated by bacterial cells and sand particles which consolidate the crack space.

Publications:

- V Srinivasa Reddy, Ch Sasikala and S Shrihari, *Crack Healing Efficiency of Bacteria Induced Concrete*, International Journal of Advanced Research in Engineering and Technology, 11(11), 2020, pp. 1777-1786.
- V Srinivasa Reddy, Ch Sasikala and S Shrihari, *Refining Concrete's micro-structure by enzymatically-induced carbonate precipitation through urease activity of bacteria*, International Conference on Inventive Research in Material Science and Technology (ICIRMCT 2021)" organized by RVS Technical Campus, Coimbatore, India, 22-23, January 2021

Patents and Student Projects:

- A Patent filing is under processing (In Draft stage)
- An M.Tech. student Ms. Ravulaparathi Sudha Lahari (18241D2029) submitted her project based on this work (Title: Bio-Mediated Sandy Soil Stabilization Using Urease Enzymatic Calcite Precipitation: A Sustainable Solution).

Title of the project:

REHABILITATION OF CONCRETE WITH BACTERIA (BACTERIAL CONCRETE)

Funding Agency: PACHAYAT RAJ, KANDUKUR, ANDHRA PRADESH

Principal Investigator:

Dr V Srinivasa Reddy, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad

Date of commencement: 13/09/2017

Grant: 2.00 lakhs **Duration:** 2 Year

Date of completion: 12/09/2019

Objectives as Proposed:

1. To investigate and formulate a strategy to present Bacterial Concrete as best innovative self-healing method in Concrete structures for Indian conditions
2. To give recommendations about its practical usability and feasibility in terms of cost savings, energy savings, ecological & environmental effects and health hazards along with techno-commercial value.

Project Outcomes:

1. Bacteria treated fly ash aggregates bacterial concrete (FAAC) which yields high compressive strength than untreated fly ash aggregate bacterial concrete which are highly porous in nature
2. Addition of bacteria to concrete has significantly increased the strength and durability of concrete due to pore refinement by bacteriogenic calcite mineral plugging in bacteria induced concrete.

Publications:

1. "Analytical Model For Predicting Stress-Strain Behaviour Of Bacterial Concrete" International Journal of Civil Engineering and Technology (IJCIET), Volume 9, Issue 11, November 2018, pp. 2383–2393 (SCOPUS Indexed)
2. "Effect Of Microbial-Induced Calcite Precipitation On The Performance Of Concrete", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN:2349-5162, Vol.6, Issue 6, page no.307-311, June-2019, (UGC Approved Journal No 63975)
3. "Performance Enhancement Of Light Weight Concrete Using Microbial Induced Calcite Precipitation By *Sporosarcina Pasteurii*", K Satya Sai Trimurthy Naidu, M V Seshagiri Rao, V Srinivasa Reddy, UKIERI Concrete Congress, 5 – 8 March 2019, NIT Jalandhar, India

Ph.D. Project:

1. Mr. Kolla Satya Sai Trimurthy Naidu, Roll No.:1203PH0513, JNTU Hyderabad (Title: Performance and Crack Healing Efficiency Evaluation of Fly Ash Based Bacterial Concrete)

M.Tech. Project:

1. Mr. C. Bhasker (16241D2001), Gokaraju Rangaraju Institute of Engineering and Technology Hyderabad. (Title: Effect of biotic and abiotic factors on bacterial activity in enhancing the performance of bio-cement mortar)

Title of the project:

STUDIES ON THE PROPERTIES OF NANO-SILICA BASED SELF-COMPACTING CONCRETE

Funding Agency: LANCO Technology Park

Principal Investigator:

Dr V Srinivasa Reddy, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad

Date of commencement: 04/10/2017

Grant: 1.00 lac **Duration:** 2 Years

Date of completion: 03/10/2019

Objectives as Proposed:

1. To study the effect of optimum nanosilica and micro silica on the properties of the concrete.
2. To characterize the microstructure of nanosilica based concrete
3. To assess the mechanical and durability properties of nanosilica based

Project Outcomes:

1. The dosage of nano silica in SCC is optimized and its characterization using SEM and XRD studies
2. The effect of Nano Silica on mechanical properties such as compressive strength, split tensile strength, flexural strength, impact strength, toughness and stress- strain behavior of SCC is quantified.
3. Durability properties of Nano Silica SCC such as corrosion resistance, permeation properties, effects of Thermal Cycles and Elevated Temperatures is assessed.

Publications:

1. *Effect of Nano silica on the strength properties of Self-compacting concrete*, International conference on Sustainable materials and its green technologies for Industry 4.0, SMiGT-2021, 07-09 April 2021 ([IOP Conference Series: Materials Science and Engineering](#))
2. *Stress - strain behaviour of confined nano silica-based concrete*, E3S Web of Conferences 309, 01048 (2021), <https://doi.org/10.1051/e3sconf/202130901048>
3. *Performance Evaluation of Nano Silica Concrete*, International Conference on Design and Manufacturing Aspects for Sustainable Energy ICMED-2020, E3S Web of Conferences 184, 01076 (2020)

B.Tech. Project

1. Effect Of Nano-Silica On Compressive Strength And Permeation Properties Of Self-Compacting Concrete, (K. Harish 14241A0180 A. Ravikiran Goud 14241A0154, K. Kranthi Kiran Reddy 14241A0178, K. Shiva Srikanth 14241a0185, A. R. K. Pawan Kalyan 15245A0113), GRIET Hyderabad.

M.Tech. Project:

1. Influence of Colloidal Nano Silica on the Properties of M50 Grade Self Compacting Concrete, Ravuri Sai Srinivas (16241D2008), GRIET Hyderabad
2. Effect Of Nano-Silica On Compressive Strength And Permeation Properties Of Self-Compacting Concrete, B. Sai Priya (16241D2009), GRIET Hyderabad

Title of the project:

CHARACTERIZATION AND PERFORMANCE EVALUATION OF ULTRA-HIGH STRENGTH STEEL FIBRE REINFORCED REACTIVE POWDER CONCRETE FOR STRUCTURAL APPLICATIONS

Funding Agency: Nagarjuna Construction Company Ltd (NCC Ltd)

Principal Investigator:

Dr V Srinivasa Reddy, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad
Co-PI: Dr. K. Satyanarayana, Department of Mechanical Engineering, GRIET, Hyderabad.

Project Approval Date: 15 February 2019

Grant: 7.5 lakhs **Duration:** 5 Years

Status: Ongoing

Objectives as Proposed:

1. To formulate optimized RPC mix compositions and to investigate the mechanical properties of an RPC formulation developed using indigenous materials under compression, tension, shear and flexure for various dosages of fibre.
2. To choose optimum pressure and heat curing regime techniques
3. To model the stress-strain characteristics on the basis of performed direct compression and tensile tests
4. To develop RPC angle, channel, I and rectangular sections of various heights with different dosages of micro steel fibres to analyze the behaviour in compression and flexure.
5. To develop bolted plate section for determining the edge distance to be used in the bolted connection.
6. To investigate the behavior of steel tubes in-filled with RPC of various fibre dosages were tested for compression.
7. To develop the predictor equations for basic properties of RPC and developing a finite element model using ANSYS finite element package and for analyzing the compression and flexure behaviour of RPC structural elements.

Expected Outcome of the Proposal

1. An optimized RPC mix proportion will be formulated to achieve a very high compressive strength using indigenously available materials and simple process techniques.
2. Behaviour of steel fibred RPC strengths under compression, tension, shear and flexure will be evaluated. Stress-strain models will be formulated to predict the complete stress-strain behaviour of steel fibred RPC in both the pre-peak and post-peak regime.
3. The toughness index of RPC will also be assessed to understand the post peak energy absorption capacity of RPC.
4. To depict the performance of RPC for use in structural applications, various shapes of RPC structural sections viz., angle, I and channel with various volume fractions of fibre contents will be prepared and their behaviour under compression and flexural will be studied to assess the energy absorption and load carrying capacity of these sections for use in prefabricated structural elements.
5. Performance of RPC bolted plate connections with optimized edge distances will be investigated under direct tension. Behavior of prefabricated RPC joints or in-filled tubes, with various fibre dosages, under compression will also be studied.
6. Predictor equations for basic properties of RPC and models will also be generated using ANSYS finite element package for analyzing the compression and flexure behaviour of RPC structural elements to draw correlation between experimental and analytical data obtained
7. Publications
8. Patent

Title of the project:

FUND FOR IMPROVEMENT OF S&T INFRASTRUCTURE IN UNIVERSITIES AND HIGHER EDUCATIONAL INSTITUTIONS (FIST) PROGRAM

Funding Agency: DST

Principal Investigator:

Dr V Srinivasa Reddy, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad

Co-PI: Dr. K. Satyanarayana, Department of Mechanical Engineering, GRIET, Hyderabad.

Project Approval Date: 16 January 2018

Grant: 99

lakhs **Duration:** 5 Years

Status: Ongoing

Equipments procured:

1. Scanning Electron Microscope
2. Core Scan

Title of the project:

MODERNISATION & REMOVAL OF OBSOLESCENCE (MODROB)

Funding Agency: All India Council for Technical Education (AICTE)

Project Coordinator:

Dr. G.V.V.Satyanarayana, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad

Project Approval Date: 04 January 2019

Grant: 7.31 lakhs **Duration:** 1 Year

Date of Completion: 31 March 2020

Equipments procured:

1. PROFOMETER PM-600
2. PROFOMETER CORROSION