

SOURADEEP GUPTA (Dr.)

Nationality: Indian | **Date of birth:** 8th September 1988

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ACADEMIC QUALIFICATION

Aug' 2014 – Aug' 2018	Doctor of Philosophy (PhD.) (Building) Department of Building, National University of Singapore Dissertation title: <i>Biochar enhanced concrete for better performance and more effective self-healing</i> Cumulative average point: 4.92 out of 5
Dec' 2010- Aug' 2012	Master of Science (Major: Structural Engineering) Department of Civil and Environmental Engineering, National University of Singapore Cumulative average point: 3.95 out of 5
Jul' 2006-May' 2010	Bachelor of Technology (with Honors) Department of Civil Engineering, National Institute of Technology, Jamshedpur, India Cumulative grade point average: 8.38 out of 10

PROFESSIONAL EXPERIENCE

Jul'2021 - current	Assistant Professor, Centre for Sustainable Technologies, The Indian Institute of Science, Bangalore
Jan' 2020 – Nov' 2020	Post-doctoral fellow at school of Civil and Environmental Engineering, The University of New South Wales, Sydney <ul style="list-style-type: none">Investigation of carbon sequestration technologies in building materialsInvestigation of 3D printing of lightweight concrete materials.Preparation of proposals to Australian Research Council and industry entities.Supervision of graduate research dissertations.
Nov' 2020 – Jul'2021	Australian Research Council's Discovery fellow (ARC DECRA), The University of New South Wales <ul style="list-style-type: none">Lead investigator (principal investigator) of the project "Scrubbing pollutant gases from air via biochar-foam concrete technology".Developing novel solutions in terms of porosity and chemical composition for direct capture of carbon dioxide and sulfur oxide pollutants in lightweight composites.

- April' 2020 - current Founder / Research and Development advisor at Biochar Innovations Pte. Ltd
- Lead product design and development of biochar enhanced concrete and biochar-air filter
 - Evaluation of market for structural and non-structural applications of biochar-enhanced building materials
 - Preparation of proposals and budgets for government grants and investments
- Nov' 2018 – Jan' 2020 Post-doctoral research fellow at department of Building, National University of Singapore.
- Investigation of polymer 3D printing to deliver controlled low strength building materials with improved ductility
 - Investigation of hydration and mechanical behavior of biochar-ultra high-performance cementitious composites
 - Investigation of treatment methods and valorization of low-silica rice husk ash and biochar as admixture in cement mortar
 - Development of self-healing fiber reinforced cementitious materials
 - Oversee safe operations and procedures as safety lead
- Oct' 2013- Jul' 2014 Research and Development Engineer, Admaterials Technologies Pte Ltd., Singapore.
- Responsible for drafting proposals to Govt. authorities, testing and certification of green building products including cement, concrete, tiles, and façade materials.
 - Contributed to development of Asphalt Testing laboratory including equipment procurement as per standard, calibration, space design and running trial tests.
 - Developed and validated analytical test methods and perform laboratory equipment qualification as per local standards.
 - Developed training materials and deliver technical training to laboratory colleagues.
- Aug' 2012- Sept' 2013 Structural Engineer, CB&I Singapore Pte. Ltd.
- Responsible for designing and analyzing steel modules for onshore oil and gas projects including stair tower, pipe rack and waste heat recovery units.
 - Checking of structural design drawings for execution at site.

PUBLICATIONS AND PATENTS

International Journal articles: **25**; Peer reviewed conference articles: **10**; Book Chapters: **3**; Patent application: **1**

Total citations: **1090**; h-index = **17**; i10 index = **21**; Field weighted citation impact (FWCI) = **4.06** (Engineering category)

- Gupta, S., Kua, H.W. Encapsulation technology and techniques in self-healing concrete. Journal of Materials in Civil Engineering, American society of civil engineers, 2016, 28, 1-15. (**Impact factor = 2.16**).

**International
Journal
publications**
(All SCI indexed)

- Gupta, S., Kua, H.W., Cynthia, S.Y.T. Use of biochar-coated polypropylene fibers for carbon sequestration and physical improvement of mortar. *Cement and Concrete Composites*, 2017, 83, 171-187. **(Impact factor = 7.84).**
- Gupta, S, Dai Pang, S., Kua, H.W. Autonomous healing in concrete by bio-based healing agents—A review. *Construction and Building Materials*, 2017, 146, 419-428. **(Impact factor = 6.14).**
- Gupta, S, Kua, H.W. Factors Determining the Potential of Biochar as a Carbon Capturing and Sequestering Construction Material: Critical Review. *Journal of Materials in Civil Engineering*, American society of civil engineers, 2017, 04017086. **(Impact factor = 2.16).**
- Gupta, S, Kua, H.W. Effect of water entrainment by pre-soaked biochar particles on strength and permeability of cement mortar. *Construction and Building Materials*, 2017, 159, 107-125. **(Impact factor = 6.14).**
- Gupta, S, Kua, H.W., Dai Pang, S. Healing cement mortar by immobilization of bacteria in biochar: An integrated approach of self-healing and carbon sequestration. *Cement and Concrete Composites*, 2018, 86, 238-254. **(Impact factor = 7.84).**
- Gupta, S, Kua, H.W., Koh, H.J. Application of biochar from food and wood waste as green admixture for cement mortar. *Science of Total Environment*, 2018, 619, 419-435. **(Impact factor = 7.96).**
- Gupta, S, Kua, H.W., Low, C.Y. Use of biochar as carbon sequestering additive in cement mortar. *Cement and Concrete Composites*, 2018, 87, 110-129. **(Impact factor = 7.84).**
- Gupta, S, Kua, H.W., Pang, S.D. Biochar-mortar composite: Manufacturing, evaluation of physical properties and economic viability. *Construction and Building Materials*, 2018, 167,874-889. **(Impact factor = 6.14).**
- Gupta, S, Kua, H.W. Combination of Biochar and Silica Fume as Partial Cement Replacement in Mortar: Performance Evaluation Under Normal and Elevated Temperature. *Waste and Biomass Valorization*, 2019, 1-18. **(Impact factor = 3.70).**
- Gupta S; Kua H.W.; Pang S.D. Combination of polypropylene fibers and superabsorbent polymers to improve physical properties of cement mortar. *Magazine of Concrete Research*, 2018, 70 (7), 350-364. **(Impact factor = 2.50).**
- Gupta, S, Kua, H.W. Carbonaceous micro-filler for cement: effect of particle size and dosage of biochar on fresh and hardened properties of cement mortar. *Science of Total Environment*, 2019, 662, 952-962. **(Impact factor = 7.96).**
- Gupta, S, Kua, H.W., Aday, A.N, Wil V. Sruber III. Biochar-immobilized bacteria and superabsorbent polymers enable self-healing of fiber-reinforced concrete after multiple damage cycles. *Cement and Concrete Composites*, 2019, 100, 35-52. **(Impact factor = 7.84).**
- Dixit, A., Gupta, S., Kua H.W., Pang S.D. Waste valorization using biochar for cement replacement and internal curing in UHPC. *Journal of Cleaner Production*, 2019, 238, 117876 **(Impact factor = 9.29).**
- Gupta, S., Kua, H.W., Pang, S.D. Effect of biochar on mechanical and permeability properties of concrete exposed to elevated temperature. *Construction and Building Materials*, 2020, 234, 117338 **(Impact factor = 6.14).**
- Muthukrishnan, S; Gupta, S; Kua H.W. Application of rice husk biochar and thermally treated low silica rice husk ash to improve physical properties of

cement mortar. Theoretical and Applied Fracture Mechanics, 2019, 104, 1-12. **(Impact factor = 4.02).**

- Pavani D; Avanthi, I.; Gupta, S; Kua, H.W.; Ok, YS et al. Biochar-based adsorbents for carbon dioxide capture: A critical review. Renewable and Sustainable Energy Reviews. Vo. 119, March 2020, 109582. **(Impact factor = 14.98).**
- Gupta, S; Kua H.W. Application of rice husk biochar as filler in cenosphere modified mortar: Preparation, characterization and performance under elevated temperature, Construction and Building Materials, 2020, 253, 119083, 1-16. **(Impact factor = 6.14).**
- Gupta, S; Palansooriya K.N.; Dissanayake P.D.; OK, Y.S.; Kua H.W. Carbonaceous inserts from lignocellulosic and non-lignocellulosic sources in cement mortar: Preparation conditions and its effect on hydration kinetics and physical properties, Construction and Building Materials, 2020. **(Impact factor = 6.14).**
- Gupta, S; Krishnan, P; Kashani, A.; Kua H.W. Application of biochar from coconut and wood waste to reduce shrinkage and improve physical properties of silica fume-cement mortar. Construction and Building Materials, 2020. 262, 120688. **(Impact factor = 6.14).**
- Gupta, S; Muthukrishnan S.; Kua, H.W. Comparing influence of inert biochar and silica rich biochar on cement mortar – hydration kinetics and durability under chloride and sulfate environment. Construction and Building Materials, 2020, 268 (121142), **(Impact factor = 6.14).**
- Hu, Q; Jung, J; ...Gupta, S. Biochar Industry to Circular Economy. Science of the Total Environment, 2021, 757 (143820) **(Impact factor = 7.96).**
- Gupta, S. and Kashani, A. Utilization of biochar from unwashed peanut shell in cementitious building materials – Effect on early age properties and environmental benefits. Fuel Processing Technology, 2021. 218 (106841) **(Impact factor = 7.03).**
- Gupta, S.; Kashani A, Mahmood, A.H. Carbon sequestration in cementitious composites using biochar and fly ash – effect on mechanical and durability properties. Construction and Building Materials, 2021, 291(123363) **(Impact factor = 6.14)**
- Beiyuan J.; Bolan, N.; Gupta, S.; Hou, D; Joseph S; Jung, S.; Kim K.H.; Kua, H.W.; Kumar, M.; Kumar, V.; Kwon, E.; OK, Y.S.; Perera, V.; ...Van Zwitien, L.* Multifunctional applications of biochar beyond carbon storage. International Materials Review, 2021 **(Impact factor = 21.08). Accepted.**
* *Equal contribution from all authors.*
- Gupta, S. Carbon sequestration in cementitious matrix containing pyrogenic carbon from waste biomass: a comparison of external and internal carbonation approach. Journal of Building Engineering, 2021, 102910 **(Impact factor = 5.318).**

Under review

- "Greening" Mortar with Biochar - Effects of Pore Profile and Particle Size. (with Harn Wei Kua, National University of Singapore)
- Application of biochar as a green admixture in lightweight cement-based foamed mortar – effect on rheology, carbon sequestration, mechanical and durability properties (with Alireza Kashani, The University of New South Wales, Sydney)

Conference presentations and invited lectures

- Gupta, S., Kua, H.W., Pang, S.D., 2019. Repeatable self-healing by biochar immobilized bacteria in fiber reinforced concrete, Engineering Mechanics Institute (EMI) conference, California Institute of Technology, USA.
- Dixit A., Gupta, S., Pang S.D., Kua, H.W., 2019. Cement replacement and improved hydration in ultra-high performance concrete using biochar. International conference on application of superabsorbent polymer and other new admixture towards smart concrete, South Africa.
- Gupta, S., Kua, H.W., Pang, S.D., 2019. Biochar-concrete composites – manufacturing, characterization and performance evaluation under elevated temperature, International Conference on Bio-based Building Materials (ICBBM), Belfast, United Kingdom.
- Gupta, S., Kua, H.W., Pang, S.D., 2017. Autonomous Repair in Cementitious Material by Combination of Superabsorbent Polymers and Polypropylene Fibres: A Step Towards Sustainable Infrastructure, World Sustainable Built Environment Conference, Hongkong, pp. 2866-2873.
- Gupta, S., Kua, H.W. 2017. Biochar as bond enhancement in fiber reinforced mortar. International Conference on Bio-based building materials (ICBBM), Clermont-Ferrand, France.
- Kua, H.W., Gupta, S., 2019. Biochar-mortar composite – manufacturing, characterization and economic viability. RILEM week conference, Nanjing, China.
- Gupta, S., Kua, H.W., Pang, S.D., 2017. Cementitious composites capable of carbon sequestration and self-healing. 6th International Conference on Self-healing materials, Friedrichshafen, Germany.

Lectures (invited)

- Keynote speaker, International Conference on Structures, Material and Construction 2021 (ICSMC), to be held in Himachal Pradesh, India.
- Gupta, S. Biochar added high strength concrete with enhanced durability and self-healing under multiple cycles of loading. 3rd E2S2-CREATE Biochar workshop program, National University of Singapore.
- Gupta, S. Engineered biochar to deliver durable and self-healing concrete – a sustainable and novel building material from waste stream. Early Career Academic Network (ECAN) connections seminar, UNSW, Sydney, Australia
- Interview and advisory workshop with The Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia on decarbonization roadmap using building materials.

Book Chapters

- Cement Replacement and Improved Hydration in Ultra-High Performance Concrete Using Biochar. RILEM Book Series, vol. 24 (2020), pp: 222-229.
- Application of biochar as sustainable admixture in cement and its potential as coating on PVA fiber in mortar. IOP book series, (2020). Accepted. Online ISBN: 978-0-7503-2660-5. Edited by Alberto Tagliaferro, Carlo Rosso and Mauro Giorcelli.
- Biochar-based circular economy. IOP book series, (2020). Online ISBN: 978-0-7503-2660-5. Accepted. Edited by Alberto Tagliaferro, Carlo Rosso and Mauro Giorcelli.

- Patent**
- NG May Shuan, Souradeep Gupta, Harn Wei Kua. Sustainable construction material, method of preparation and use thereof. (PCT/SG2018/050206). Approved for filing in Singapore, India, China and USA.

ENTREPRENEURSHIP EXPERIENCE AND RESEARCH FUNDING

- Entrepreneurship**
- Graduated from *Graduate Research and Innovation Program* (GRIP), which is a competitive entrepreneurship program at NUS to support deep-tech start-ups.
 - Founded technology start-up, '**Biochar Innovations Pte Ltd**'. The company, currently based in Singapore, with the vision of "zero-waste" by using locally generated wastes to develop building products.

- Highly competitive grant as chief investigator: Australian Research council (ARC) Discovery Early Career Research Award: Total funding amount of AUD 450,000 for 3 years.
Title: Scrubbing pollutant gases from air via biochar-foam concrete technology.
Funding agency: Australian Research Council, Australia.

**Research and
Development
Funding received**

- Start-up seed grant. INR 1.50 crores (USD 200,000) for 1 year.
Title: Carbon sequestration in sustainable concrete using resources from inorganic waste streams – additive manufacturing, performance evaluation and environmental benefits
Funding agency: Indian Institute of Science
- Research and innovation grant as chief-investigator from NUS Enterprise at National University of Singapore: Total funding amount of SGD 100,000 for 1 year.
Title: Development of biochar-cement composites for waterproofing application in buildings.
Funding agency: NUS Enterprise
- Competitive Enterprise Singapore grant (ESG, a Govt. enterprise) as chief investigator (CI). Total funding amount: of SGD 500,000 for 2 years.
Title: Development of best-in class Biochar-Concrete for non-structural purposes.
Funding agency: Enterprise Singapore, a Singapore Govt. Agency.
- Collaborative industry grant with Nitto Denko (Singapore) as co-chief investigator (co-CI). Total funding amount: of SGD 138,000 for 1 year.
Title: Development of best-in class Biochar-Concrete for non-structural purposes.
Funding agency: Building and Construction Authority, a Singapore Govt. Agency.

ADVISORY SERVICES

- Advisory**
- Expert advisor to Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia on carbon sequestration in building materials as a part of CO₂ commodisation roadmap (the project).

Teaching

- Certified teaching assistant by Center for Development of Teaching and Learning (CDTL), National University of Singapore.
- Teaching coordinator and tutorial for coursework module **PF2504: Materials technology**. Department of Building, School of Design and Environment, NUS.
- Laboratory tutorial for coursework module **PF1104: Environmental Science for Building**. Department of Building, NUS.
- Teaching Assistant and guest lecturer for the module **PF2105: Research Methods**. Department of Building, National University of Singapore.
- Teaching assistant for **CVEN4102: Operations and Projects, and CVEN 2101: Engineering constructions** at The University of New South Wales, Sydney
- Co-lecturer for module **CVEN 4102: Sustainability in Construction** at The University of New South Wales, Sydney

Research supervision

Mentorship and supervision of final year projects and graduate students on their dissertation projects:

(Master's thesis: 5)

Bachelor's thesis: 5)

- Using packing model and water-film thickness to explain rheology and strength development of biochar-cement composites. **Master's thesis**. (Kaisheng Huang, 2020/2021, UNSW Sydney)
- Evaluation and application of biochar as admixture in cement mortar. **Master's thesis** (Han Tianhao, 2019/2020, UNSW Sydney)
- 3D printable lightweight cementitious composites for carbon sequestration. **Master's thesis** (Michael Ting, 2019/2020, UNSW Sydney)
- Influence of material selection on early-stage property and 3D printability of cementitious mixes. **Master's thesis**. (Yujin Liu, 2019/2020, UNSW Sydney)
- Lightweight cenosphere concrete for 3D printing. **Master's thesis**. (Saunil Dadawala, 2019/2020, UNSW Sydney)
- Decentralized greenhouse: a feasibility study of biochar-based method for sequestering carbon dioxide emissions. **Bachelor's (Hons.) thesis**. (Lee Rey Vern, 2015/2016, NUS, Singapore)
- Use of biochar as carbon mineralization sites in fiber-reinforced cement. **Bachelor's (Hons.) thesis** (Cynthia Tan, 2016/2017, NUS, Singapore)
- Investigating the feasibility of using biochar saturated with carbon dioxide to strengthen cement mortar. **Bachelor's thesis** (Kester Low, 2016/2017, NUS, Singapore)
- Investigating the properties of mortar mixture containing biochar from mixed food waste. **Bachelor's thesis** (Hui Jun Koh, 2016/2017, NUS, Singapore)
- Study of Self-Healing Properties of Concrete Containing Synthetic Super Absorbent Polymers and Polyvinyl Alcohol Fibers. **Bachelor's thesis** (Monica Lim, 2017/2018, NUS, Singapore)
- Novel Treatment methods to valorize high carbon rice husk ash and biochar to improve properties of cement mortar. **Graduate research assistant supervision** (Shravan Muthukrishnan, 2018/2019, NUS, Singapore)

- Application of biochar as supplementary admixture for ferro cement roofing tiles. **Bachelor's thesis** (Baradhan S/O Chandrasekharan, 2019/2020, NUS, Singapore).

PROFESSIONAL MEMBERSHIP

Feb' 2013- current	Member of Singapore Concrete Institute (SCI)
Oct' 2014 – Oct' 2016	Director at Singapore Concrete Institute
Mar' 2014- current	Member of American Concrete Institute (ACI), Singapore chapter.
May' 2021- current	RILEM TC member CNC: Carbon-based nanomaterials for multifunctional cementitious matrices

AWARDS AND RECOGNITIONS

- Ssangyong Cement Gold Medal and Book Grant for being Best graduate in the area of concrete technology during master's program at National University of Singapore (proceedings worth SGD 15,000, 2012)
- Most cited paper (Application of biochar as carbon sequestering additive in cement mortar), Cement and Concrete Composites (Apr – May 2020)
- Ministry of Education (MoE) scholarship for PhD. research (PhD. tuition and additional stipend of SGD 110,000, 2014-2018)
- International Travel Grant award from National University of Singapore (SGD 1500, 2017)
- Outstanding Reviewer award from Journal of Cement and Concrete Composites, Elsevier, 2018
- Ministry of Singapore tuition fee scholarship during master's program at National University of Singapore (SGD 10,000, 2010-2012)
- Best paper award for 'Power generation by traffic loads using piezoelectric tiles' under 'Technical paper presentation' category at the national level techno-management program 'Ojass' at National Institute of Technology, Jamshedpur (2008).

PROFESSIONAL TRAINING

- 2010: Management development program jointly conducted by Xavier Labor Research Institute (XLRI), Jamshedpur and TRF Ltd., (a TATA enterprise).
- 2010: Construction project management training by National Institute of Construction Management and Research (NICMAR), Pune, India.
- 2014: Environmental and Building Sustainability training by Singapore contractor association Ltd. (SCAL). The areas covered included mitigation measures to climate change, indoor air quality, energy management in buildings, and sustainable building materials.
- 2019: Deep-tech entrepreneurial training on technology development, intellectual property, patent landscaping value propositions, business modelling, financial forecasting and pitching.

REVIEWER / EDITORSHIP FOR ACADEMIC JOURNALS

- **Editor (special issue):** “Bio-based and Inorganic Waste Streams for Sustainable Cementitious Building Materials”, Frontiers in Built Environment.
- **Co-Editor:** Special issue on “Latest Advancements in the development of a sustainable and carbon-neutral concrete”, MDPI.
- **Co-Editor (special issue):** “Biochar in a changing world: state of art and future applications”, Frontiers in Built Environment
- **Reviewer:** Cement and Concrete Composites, Elsevier; Construction and Building Materials, Elsevier; Journal of Cleaner production, Elsevier; Nature Scientific reports; Science of the Total Environment, Elsevier.

MEDIA ARTICLES ON MY RESEARCH

- “Building with biochar”. Featured by quarterly publication of NUS Enterprise, “Enterprise Sparks”, June 2021 at National University of Singapore
- “Scientists develop new construction method to create stronger buildings”. Channel News Asia (<https://www.channelnewsasia.com/news/singapore/scientists-develop-new-construction-method-to-create-stronger-10130116>)
- “NUS team develop new method to strengthen building structures by mixing wood waste with concrete”. The Straits Times, National Daily of Singapore (<https://www.straitstimes.com/singapore/nus-team-develop-new-method-to-strengthen-building-structures-by-mixing-wood-waste-with>)
- “Novel NUS technique strengthens building structures using wood waste” National University of Singapore Press (<http://news.nus.edu.sg/press-releases/biochar-in-concrete>)

COMMITTEE CONTRIBUTION

- 2021 – current: Safety committee member at the Centre for Sustainable Technologies, Indian Institute of Science, Bangalore
 - 2018 – 2020: Safety lead for Smart Materials Laboratory cluster at Department of Building, National University of Singapore, Singapore.
 - 2016: Organizing committee team member for International Conference on Countermeasures to Urban Heat Island.
 - 2018: Organizing committee team member for World’s First International Conference on Construction 3D Printing (IC3dP) “Genesis of Future Construction.
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