PRIYADHARSHINI PERUMAL

The candidate is a developing researcher with the focus on utilizing industrial wastes into construction materials to avoid the depletion of natural resources due to the growing infrastructure needs. She started pursuing her interest as a lead student researcher in a project sponsored by Neyveli Lignite Corporation (NLC) India Limited. The candidate was able to develop coarse and fine aggregate with lignite-based fly ash and bottom ash, respectively. These products have been successfully used to construct a model building in the power house of NLC Limited.
With that, the candidate was excited to continue her research in alternative aggregates which could solve the current burning issue of shortage of river sand. She joined her PhD with the funding from Ministry of Human Resource and Development (MHRD) to work in utilization of excavation soil (including mine spoil) in construction materials. The candidate worked on treatment methods to stabilize clay present in soil and to use the treated excavated soil wastes in construction materials as fine aggregate. She could develop a zero-waste technology to treat the mine spoil and was successful in using it as fine aggregate in cement/ geopolymer systems. This work has been published in reputed journal articles and fetched best paper award in a conference held by "International Solid Waste Management Society" in USA. As outcome of her research experience, the candidate has continuous upgrading of knowledge in her research interest, teaching and leadership skills. She has very good interpersonal skills in working with team, collaborations and can work independent with new ideas and confident to face complex research problems.

PERSONAL DETAILS

Name: Priyadharshini Perumal

Country/Nationality: India/Indian

Current place of work: University of Oulu, Finland

Email: priyadharshini.perumal@oulu.fi / mail2pridha@gmail.com

Phone: +358 50 477 8422

ACADEMIC ACHIEVEMENTS

07/2018 **PhD in Building Technology and Construction Management, Civil Engineering**
Indian Institute of Technology (IIT) Madras, Tamil Nadu, India.
Dissertation: *Influence of treatment methods on the performance of excavation soil as fine aggregate in mortar*

08/2013 **M.S. (By Research) in Structural and Geotechnical Engineering, Civil Engineering**
Vellore Institute of Technology (VIT) Vellore, Tamil Nadu, India
Thesis: *Experimental investigations on fly ash and bottom ash aggregates in lightweight concrete*

05/2007 **Bachelor of Engineering, Civil Engineering**
Anna University, Tamil Nadu, India.

FELLOWSHIPS

09/2020 – 08/2022 Marie-Curie individual fellowship, European Union

08/2018 – till date Post-doctoral research fellowship, University of Oulu, Finland

05/2018 – 07/2018 Pre-doctoral fellowship, Indian Institute of Technology Madras, India

01/2014 – 05/2018 MHRD fellowship from Indian Government

08/2009 – 02/2012 Institute fellowship, Vellore Institute of Technology, Vellore, India

AWARDS AND DISTINCTIONS

2018 **Institute Research Award,** for the quality and quantity of work done in doctoral thesis at IIT Madras

2017 **Best Paper Award** for the research paper based on PhD work in the "International Conference on Solid Waste Technology and Management (ICSW)" at Philadelphia, USA.

2007 Academic excellence **Gold Medal** for the best outgoing undergraduate student.

2004 **Young Scientist Award** for the research article on "Conservation of Marine Bio-sphere in Gulf of Mannar" in a state level competition organized by Oscar Foundation and Research, an NGO.

2003 Certificate of Merit for securing **District Third** in High School Public Exams.

2001 Certificate of Merit for securing **District First** in Secondary School Public Exams.

PROFESSIONAL HISTORY

08/2018 - **Post-Doctoral Research Fellow**

till date University of OULU, Finland

With the PhD degree, the candidate moved to Finland and started her career as a postdoctoral research in the Fiber and Particle Engineering Research Unit under the supervision of Professor Mirja Illikainen.

Project	**Duration**	**Important outcomes**	**Funding agency**
GeoBiz: Business from geopolymers	Aug 2018 – July 2019 (12 months)	Develepment of ultrahigh strength cement system with alkali activated industrial slag	Business Finland
CeraTail: Novel Synthesis Methods for Advanced Porous Ceramics from Mine Tailings	Jan 2019 – Dec 2019 (12 months)	Development of low embodied energy production of inert porous ceramics from mine tailings	Academy of Finland
GeoMins: Steps towards the use of mine tailings in geopolymer materials	Jan 2019 – Dec 2020 (24 months)	Mineralogical processing and activation of minetailings to be used as binders in alkali activation and heavy metal sequestration	Academy of Finland
DeConcrete: Eco-Efficient Arctic Technologies Cooperation	Nov 2019 – Oct 2022 (36 months)	Study on separation and concrete waste processing Recycling of concrete waste in fresh concrete production	Kolarctic CBC
Waste to Wealth (W2W): A total solution for municipal solid waste incinerated (MSWI) ash in geopolymer concrete	Sep 2020 – Aug 2022 (24 months)	Treatment and processing of MSWI ash Granulation of bottom ash as aggregate Production of lightweight concrete with MSWI ash	European Union (Marie-curie)

05/2018 – **Pre-Doctoral Research Fellow**

07/2018 Building Technology Division, Indian Institute of Technology (IIT) Madras, India.

Being submitted the thesis well ahead of the stipulated time, the candidate was awarded a pre-doctoral research fellowship. The candidate worked on **alkali activated aerated concrete using fly ash**. Property enhancement using slag as binary blend and a comparison of its effectiveness on class C and Class F fly ashes were studied. This research was carried out under the supervision of Professor K. Ramamurthy (Head of the Department of Civil Engineering, IIT Madras) who was also the candidate's doctoral supervisor.

01/2014 - 05/2018 **Doctoral Researcher**

Building Technology Division, Indian Institute of Technology (IIT) Madras, India.

After a long maternity break of 24 months, the candidate restarted her carrier as a doctoral researcher on January 2014 in IIT Madras (India's No.1 technical institute) with a funding from Ministry of Human Resource and Development (MHRD). As already exposed with wastes from power plants, the candidate wanted to explore on mine spoils, a form of **excavation soil from mining industries**.
Main issue with use of excavation soils was the presence of clay in them. This affected the properties of cement mortar like strength and shrinkage. **Geopolymer mortar** was employed as a substitute system which helped using the clay in a positive way. Interestingly, geopolymerisation worked out to be the best alternative for earth-based materials with reactive clay. Treatment methods such as **wet sieving (combination of washing and sieving) and stabilization (chemical and thermal)** were applied to three different excavation soils. A zero-wastage technology to treat the excavation soil and use them as alternative fine aggregate was suggested. From embodied energy analysis, it was also found that use of alternative fuels like waste rubber/ municipal solid waste will bring the cost of the thermally treated material well below the cost of conventional fine aggregate alternatives such as crushed stone.
The candidate also co-supervised three of the master thesis on utilizing foundry sand, bagasse ash and mines overburden in construction materials.

02/2012 - 01/2014 **Maternity Break**

08/2009 - 02/2012 **Graduate Researcher**

Department of Civil Engineering, VIT, India.

A research project funded by Neyveli Lignite Corporation (NLC) India Ltd., was carried out during this period. In this project, **lignite-based fly ash and bottom ash** was utilized in construction materials under the guidance of Professor Mohan Ganesh and Professor A. S. Shanthi.
Valorization of bottom ash in large quantities was possible with the **removal of carbon particles**. As a part of the project, an equipment was designed and fabricated to eliminate carbon from bottom ash. The high silica content, pozzolanic property and available size range made bottom ash a potential alternate for fine aggregate in concrete. **Fly ash was pelletized with binders like lime, cement** and used as coarse aggregate. The test results obtained by this experimental program encourage the usage of fly ash and bottom ash in large volume as aggregate replacement material. Reduced weight of concrete with the use of these materials reflected in the cost savings in foundation, formwork, handling and transportation.
A **demonstration house was constructed** in the premises of NLC with the manufactured bottom ash and fly ash in 2012 and continuous observation of this building encourages the use of these materials in construction.

07/2007 - 07/2009 **Assistant System Engineer**

TATA consultancy Ltd., Chennai, Tamil Nadu, India.

Being graduated with bachelor's degree, the candidate got placed in a software firm direct from campus. She was working on Mainframes with COBOL and JCL for the Citi Bank. Even though the job paid her well enough, with the interest being in research she could not continue the job. However, she excelled even in such situations and received several accolades from the clients including, "**star performer of the month**" and rated 5/5 (far exceeded expectations) for her performance in software coding and testing.
She learnt the **managerial skills, team playing, communication, project planning** and a professional life style through this experience.

PUBLICATIONS

Scopus ID: 56884764000 Orchid ID: 0000-0002-7731-2016

ResearchGate: Priyadharshini Perumal Google Scholar: Priyadharshini Perumal

Scopus Indexed Journals

1. **Priyadharshini, P.,** Piekkari, K., Sreenivasan, H., Kinnunen, P., Illikainen, M. (2019). One-part geopolymers from mining residues – Effect of thermal treatment on three di ff erent tailings. *Minerals Engineering*, 144, 106026, Elsevier. [IF: 3.3]
2. **Priyadharshini, P.,** Ph, D., Ramamurthy, K., Ph, D., Asce, M., Robinson, R.G., Ph, D. (2019). "Influence of Temperature and Duration of Thermal Treatment on Properties of Excavated Soil as Fine Aggregate in Cement Mortar." *Journal of Materials in Civil Engineering*, 31 (8): 04019137 – 10, ASCE. [IF: 1.98]
3. **Priyadharshini, P**., Ramamurthy, K., & Robinson, R. G. (2018) "Performance of dry-sieved and stabilized soil as fine aggregate in cement mortar." *Construction and Building Materials*, Elsevier. [IF: 3.5]
4. **Priyadharshini, P**., Ramamurthy, K., Robinson, R. G. (2018) "Sustainable reuse of excavation soil in cementitious composites." *Journal of Cleaner Production*, 176, 999 – 1011, Elsevier. [IF: 5.7]
5. **Priyadharshini, P**., Ramamurthy, K., Robinson, R. G. (2017). "Excavated soil waste as fine aggregate in fly ash based geopolymer mortar." *Applied Clay Science*, 146, 81–91, Elsevier. [IF: 3.1]

Non- Scopus Indexed Journals

6. **Priyadharshini, P**., Mohan Ganesh, G., Santhi, A.S., (2012) "A review on artificial aggregates." *International Journal of Earth Sciences and Engineering*, Vol 5. No.3, pp 540-546, Cafet Innova.
7. **Priyadharshini, P**., Mohan Ganesh, G., Santhi, A.S., (2012) "Effect of lignite by-products in plastic shrinkage property of concrete" *International Journal of Scientific & Engineering Research*, Vol. 3, No. 5, pp 65-68, IJSER.
8. **Priyadharshini, P**., Mohan Ganesh.G, Santhi.A.S, (2011). "Experimental study on cold bonded fly ash aggregates.", *International Journal of Civil and Structural Engineering*, Vol. 2, No. 2, pp 493-501, IPublishing.

National and International conference papers

9. **Perumal, P.,** Illikainen, M. (2019) **"**Alkali Activation of Silicate Mine-Tailings: Response to Different Activator Sources." *Proceedings 2019, 34, 10.* The 1st International Conference on Smart Materials for Sustainable Construction-SMASCO 2019, Dec 10 –12, Luleå, Sweden.
10. **Priyadharshini, P**., Luukkonen, T., Kinnunen, P., Illikainen, M. (2019) "Design of ultra-high performance one-part geopolymer concrete with particle packing technology." *Proceedings of 39th Cement and Concrete Science Conference*, Sep 9 – 10, University of Bath, UK.
11. **Priyadharshini, P**., K. Ramamurthy, R.G. Robinson (2017). "Effect of lime and geopolymer stabilization on shrinkage property of earth mortar." *Proceedings of 32nd International Conference on Solid Waste Technology and Management (ICSW)*, Mar 19 – 22, Widener University, Philadelphia, USA (**Best Paper Award**).
12. **Priyadharshini, P**., K. Ramamurthy, R.G. Robinson (2017). "Influence of lime stabilized lake sediments as fine aggregate in cement mortar." *Proceedings of International Conference on Advances in Construction Materials and Systems (ICACMS)*, Sep 3 – 8, Rilem and IIT Madras, Chennai, India.
13. **Priyadharshini, P**., Mohan Ganesh.G, Santhi.A.S, (2012). "Effect of Cold Bonded Fly Ash Aggregates on Strength & Restrained Shrinkage Properties of Concrete.", *IEEE International Conference on Advances in Engineering, Science and Management (ICAESM 2012)*, Mar 30-31, EGS Pillay Engineering College, Nagapattinam, India (Scopus Indexed).
14. **Priyadharshini, P**., Santhi.A.S., Mohan Ganesh.G, (2011). "Application of industrial wastes in the construction industry – an overview." *Proceedings of ICI-AMAS-2011*, Feb 3-4, Indian Concrete Institute and Pondicherry Engineering College, Pondicherry, India, 339-345.

15. **Priyadharshini, P**., Santhi.A.S., Mohan Ganesh.G, (2011). "Bottom ash as secondary raw material in concrete – a review.", *Proceedings of International Conference on Advances in Materials and Techniques for Infrastructure Development (AMTID)*, Sep 28-30, National Institute of Technology, Calicut, Kerala, India.

LEADERSHIP AND TEAM WORKS

09/2019- **European Researcher's Night**

Represented Fibre and Particle Engineering research unit.

Practically demonstrated the use of industrial side streams as cementing materials.

07/2014 - 07/2018 **Student In-charge**

Lightweight Concrete Lab

Formulated safety rules for the building materials laboratories (durability, structural testing, wet lab, casting yard, environmental chambers)

Involved in the development of concrete materials lab for its proper functioning and training of new research scholars

09/2017 **Organizer (Rilem Week)**

Co-ordinated Registration team in Rilem International conference (2017) with Post and Pre-conference workshops to handle 400+ participants

Involved in Editorial committee of Proceedings of IITM–Rilem International conference on "Advances in Construction Materials and Systems" in 2017 (Managed 300+ technical papers in review process, editing and publication in 3 volumes)

12/2014 **Organizer (AICTE – ICI workshop on Advanced Concrete Technology)**

Co-ordinated a 5-day workshop on "Advanced Concrete Technology" organised by all India Council for Technical Education (AICTE) and Indian Concrete Institute (ICI)

09/2015 **Organizer (ICI-IITM National Concrete Canoe competition)**

Co-ordinated Inter-Collegiate National Concrete Canoe competition by Indian Concrete Institute (ICI) and Civil Engineering Association at IITM

SUPERVISING AND MENTORING ACTIVITIES

08/2018 – Present **Research supervisor | University of Oulu**

Completed

1. Experimental investigations on alkali activated foam concrete with impure kaolinite (Master thesis 2019)
2. Grinding techniques for improving the reactivity of mine tailings (Erasmus exchange 2019)
3. Alternative fine aggregates from industrial side streams (Eramus exchange 2019 - 2020)

On-going

4. Treatment methods for recycled concrete aggregates: enery efficient approach (Master thesis 2020)
5. Granulation and alkali activation of mine tailings (Master thesis 2020)
6. Utilization of fine recycled concrete waste in construction materials (PhD thesis 2019 - 2023)

01/2014 - 07/2018 **Graduate Teaching Assistant | IIT Madras**

Laboratory Teaching Assistant

Demonstrated experiments, evaluated lab records, prepared question papers, graded the final exam
CE3410 - Construction materials lab course for undergraduate students (2014 – 2017)
CE5090 - Construction materials lab course for graduate students (2015 – 2017)
Co-ordinated the inter-divisional lab course on civil engineering materials (construction materials, geotechnical engineering and transportation)

Mentored 6 intern (summer/winter) students from national and central institutes in research topics like geopolymer concrete, soil stabilization and mortar studies

Laboratory Assistant

Assisted in operating Scanning Electron Microscope (SEM), X-ray Diffraction Spectroscopy (XRD)
Experienced in applying microscopic technologies on biological, metallic and concrete samples

Teaching Assistant / Online course

Facilitated course video and prepared course materials for the online National Programme on Technology Enhanced Learning (NPTEL) course "Modern construction materials" presented by Professor Ravindra Gettu (Professor, IIT Madras)
Structured and designed "Introductory video" for the course
Administered NPTEL course website and clarified online queries from 100+ participants
Supported the Professor in evaluation and grading of final exam

08/2009 - 02/2012 **Graduate Teaching Assistant | VIT Vellore**

Assisted in soil mechanics lab course for undergraduate students
Handled construction materials lab course for undergraduate students
Conducted undergraduate continuous assessments and final exams
Actively helped undergraduate students in technical clarifications on their project works related to construction materials

01/2010 - 11/2010 **Instructor | CADD Centre, Vellore**

Trained students in AutoCAD and STAAD.Pro software
Guided student design projects

REVIEWER IN JOURNALS

Materials , Minerals – MDPI Publications
Journal of Cleaner Production, Energy Ecology and Environment– Elseveir Publications
Waste and Biomass Volarization, Journal of the Institution of Engineers (India): Series A (Civil, Architectural, Environmental and Agricultural Engineering) – Springer Publications

SKILLSET SUMMARY

Micro-Analytical Skills: Scanning Electron Microscopy (SEM), X-Ray diffraction spectroscopy (XRD), Infrared Spectroscopy (IR), Thermal analysis (TGA/DSC), Mercury Intrusion Porosimetry (MIP), Adiapatic calorimetry

Software Skills: Design Expert, Origin Pro, FORTRAN, STAAD.Pro, AutoCAD, Archi CAD, MS Office

Linguistic Skills: English, Tamil