



COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF POLYMER SCIENCE AND RUBBER TECHNOLOGY

Cochin, Kerala State, India-682022

Prof. (Dr.) Prasanth Raghavan, (M.Tech, PhD)
Professor (Nano Engineering)

Tel: +91-484-2575723 (O)
+91-7907533273 (M)
Fax: +91-484-2577747
Email: prasanth@cusat.ac.in
Web: www.prasanth.net.in

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Whomsoever it may concern

It is my great pleasure, as a professor and a mentor, to endorse and recommend Mr. George Varghese P. J., who is applying for the co-tutelle PhD program between IIT Kharagpur – University of Manchester dual doctoral degree program. I have known George for the last six years, initially as an undergraduate (B.Tech) student at the Department of Polymer Science & Rubber Technology (PSRT), Cochin University of Science and Technology (CUSAT), Kerala. During his undergrad studies, I have taught him four course works and have served as a member (subject expert) and guide in the evaluation panel of his minor/major project and review seminar. In the interactive classes and in project evaluations/viva voce, I have observed his inquisitive nature, scientific imaginations and in-depth knowledge in subjects. As he was the student batch coordinator and myself was the faculty coordinator in his B. Tech batch, we had many opportunities to have coffee table discussions on various subjects as well as his future plans. And I found him distinguished from the other students by his dedication towards the studies and his immense attentiveness in grasping knowledge and new concepts. Across all the lectures, I found him to be immensely interested in understanding the subject's fundamentals, as evident by the enthusiasm he showcased during classroom discussions. I still remember his minor project presentation about the synthesis of nanocellulose for biomedical application and its characterization. His project and presentation were rated the best and he secured 10 points for the same. During his B. Tech, he got a good opportunity to do project in Vikram Sarabhai Space Centre (VSSC), Indian Space Research Organization (ISRO), where students with good mark percentage are admitted. In this project (which was also George's major project), he worked on "studies on effect of flame retardants in polyurethane based inhibition systems for solid rocket motor". After B.Tech, George has worked as an Assistant Manager in India's one of the most reputed tyre industry, CEAT Ltd., Maharashtra, India from October 2017 to July 2019. Even though George was doing exceptionally good in corporate world, one night he called me and shared about his dream to get a masters degree from IITs. I was awestruck by his ambition towards research and I shared him about the experience I had during my post graduate and PhD life. Later George called and said he qualified GATE exam and he got admission in IIT Patna for Materials Science and Engineering. I still use the example of George in my class to inspire my students of how he managed to study for GATE examination in between his busy corporate life. This shows his dedication and passion towards gaining knowledge and research. Later, after George's resignation from CEAT Ltd., when the senior vice president of CEAT Ltd. visited CUSAT for campus placement drives, he was

specifically asking for “students like George”. I enquired to senior vice president about his statement on eligibility criteria. I came to know that George has worked upon and implemented an indoor testing protocol for tyre ride and handling parameters, which is now a biggest asset to the firm. Both myself and the senior VP was fascinated upon how a student from polymer background works on vehicle and tyre dynamics and finally derive a successful testing parameter for tyre ride and handling test. The amount of hard work he puts in to understanding the basics of tyre mechanics and the numerous testing methods he tried to achieve the result, which was once thought impossible for a person from polymer science background, helped him recognize as an asset to the research and development centre of CEAT Ltd.

Considering his strong enthusiasm and genuine interest in the research, I offered him a couple of projects, asked to be part of a couple of book chapters and advised him about the theoretical aspects of the experimental investigation. While working in such assigned lab works, I have observed in him a creative person with a high level of intellectual power and capability to design experiments and translate scientific concepts into useful data. The recent and fascinating work we did recently was just after the uplifting of COVID pandemic lockdown. I called George asking if he can do a project on recycling of facemask by blending with Nitrile rubber and converting it into a useful engineering product, a major environmental issue raised during the pandemic period. George readily agreed to my offer and he immediately started collecting information about the same. The explicable capability of George to effectively design experiments and scientific concepts into useful data helped in the completion of project before the expected timeline. The work was selected as the best paper in 33rd Kerala Science Congress 2021 and attracted vast media attention in both printed and visual media. Because of his enthusiasm, the simulation of these blend materials is studied in collaboration with Department of Coating and Polymeric Materials, North Dakota State University, USA and the manuscript is communicated to the ACS Macromolecules. And now the application of these blended materials in to the stealth application is under progressing well in collaboration with NPOL-DRDO, Cochin. The willingness of George to accept to carry out this N-95 face mask recycling at the peak time of the pandemic period clearly shows his positive attitude towards research and social commitment, which really impressed me a lot. Another interesting fact about George is his punctuality and the extra time he dedicates for getting his work done on time.

Also, in my lab he carried out the electrochemical exfoliation of graphene from bulk graphite for super capacitor applications. And I came to know George is working on the synthesis of few layers graphene for his M.Tech project thesis under the joint supervision of Dr. Dinesh Kotnees (Assistant professor, IIT Patna) and world renowned chemist and scientist Padmashree Dr. S. Sivaram (INSA senior scientist and honorary professor of Indian Institute of Science Education and Research (IISER) Pune). Because of his interest in learning things and enthusiasm, he co-authored a couple of book chapter on ‘Phenolic Resin; preparation, structure and properties’ in the book entitled “Handbook of Thermoset Foams, Aerogels, and Hydrogels” (Elsevier) and ‘Elastomeric composites: preparation and properties’ in the book entitled “Science and Engineering of Oleophobic and Thermostable Elastomeric Composites” (Elsevier), which is again a benchmark on his hard work and his interest in the field of research. Also, he has assisting me in writing another couple of book chapters to the book going to publish by Springer, UK and Taylor and Francis, USA. At this point, I must point out that George has very strong fundamentals on the subjects he studied and good

academic records, which made him secure the University third rank in his B.Tech batch and scored 91.3 percentile in Graduate Aptitude Test in Engineering(GATE), 2017 and due to his excellent subject knowledge, he secured a good rank in GATE during the proceeded years as well (2019).

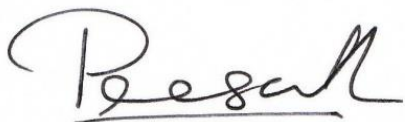
He was zealous with his work and always driven to understand how things work. He is an avid learner and quick to grasp new concepts. George is one of the most dedicated students in CUSAT and IIT, Patna, which is evident from his B. Tech CGPA and first year's results in IIT Patna. George has always been expeditious in reporting to me the experimental findings and would discuss their implications. He always came up with original ideas and I believe this will aid him in any future research endeavors. George exhibited outstanding communication skills through his proficiency in English (having a valid TOEFL score of 102 with more than 20 in every session) and conveying his ideas with great ease. Because of his communication as well as leadership skills, he has been selected as the student representative for his B.Tech batch and acted as an effective communicator between the other students and faculties/Head of the Department. During his B.Tech, I asked him to select four research articles published in Nature journals or Science, for his final year review seminar, and he made an excellent presentation and secured top score in the seminar. Also, during his project presentations and review seminars, I found a good teacher in him, from the open discussion with him I learned that his ultimate aim is to be a well-known professor through which can mould the academicians to lead the country in future, thereby serve for the society.

He is an active and jovial student having a high regard for elders along with good moral and social values. I have also noted that George is a forward-looking and optimistic person with a pleasant nature. Dr. Jabeen Fatima and Dr. Aju Chirackal my National Postdoctoral fellow, and Deepthi Anna David and Neethu Balakrishnan, some of my research students who have worked with George in my laboratory and have mentioned that George is very pleasant to work with, as he makes jokes and creates a comfortable environment for everyone to work around him. I must mention that, George is definitely a team player, who treats everyone with respect.

George with his zeal to learn, self-initiatives and intellectual abilities, is an ideal candidate for a doctoral study (PhD). His endless curiosity, combined with his proficiency in the laboratory, leads me to believe there will be no limit to his growth and achievements in research and beyond. Overall, I believe that George will be an asset to any place of work or institution and shall be able to understand new assignments easily and perform to his fullest in a very short period to accomplish any challenges that come through. Also, to date, his conduct and character are very good. His punctuality in work always wonders me, therefore, I would give him my highest recommendation for the co-tutelle PhD program between the IIT Kharagpur–University of Manchester to provide him this opportunity to justify the immense potential in him.

I wish him all success in his future endeavors.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Prasanth', with a horizontal line underneath the name.

Prof. (Dr.) Prasanth Raghavan