SPARK

Newsletter of the Department of Chemical Engineering

Edition 30

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January 2021

Highlights in this Newsletter

From HOD's Desk

We continue to fight COVID-19 with proper protocols and it is heartening to see that the vaccination has been started. The department has showed a great response to all the safety measures and our students/faculty have been dedicatedly working hard towards the development.

The university ranking list is out now. For a fifth straight consecutive year, our department student has won the University Gold Medal for first rank. I congratulate Ms. V. Swetha for this achievement. Also we have won 9 ranks in total. I appreciate all the rank holders for their meritorious excellence. Many of our students have been placed in various multi-national core and non-core industries. My best wishes for all of them for their future endeavors.

I extend my warm applaud to our faculty Dr. P. Senthil Kumar for securing a project grant of Rs.63.29 Lakh from DST. This will facilitate our research wing and would result in many good publications and other outcomes. It is also noted that he was recognized as one of the top 1% researchers of the world by Stanford University, USA.

Our faculty and students continue to contribute many papers in international journals and various book chapters published by leading research forums.

I admire Dr. K. Jagannathan and the editorial board members for compiling and designing this issue of Spark 30 - our department newsletter.

STUDENT ACTIVITIES

Anna University Ranking May 2020, Batch 2016 - 2020

S.No	Reg. Number	Student Name	CGPA	Univ Rank	Photos
1	312216203059	Swetha V	9.44	1	
2	312216203042	Priyadarshini S	9.40	2	
3	312216203001	Abhishek S	9.19	4	
4	312216203031	Madhumitha S	9.12	5	
5	312216203016	Divya Lakshmi	9.09	6	
6	312216203009	Anirudh Madhavan	9.04	8	
7	312216203005	Alaguabirami L	9.03	9	
8	312216203040	Ponraj Jenis D	9.02	10	
9	312216203041	Prasanna Kumar P	9.01	11	

PLACEMENT DETAILS - BATCH - 2016 - 2020

S.No.	Name	Company	Category	Salary per annum (Rs. in Lakhs)
1	Agalya M	Fastlab	Non-Core	500,000.00
2	Akash Bala R	Capgemini	Non-Core	380,000.00
3	Alaguabirami A	Dow Chemicals	Core	850,000.00
4	Alagusurya P	CTS	Non-Core	400,000.00
5	Anchana R	Fastlab	Non-Core	500,000.00
6	Anirudh Madhavan	FreshWorks	Non-Core	480,000.00
7	Anitha Meegal V	Pickyourtrail	Non-Core	430,000.00
8	Anusha A	Ganit	Non-Core	450,000.00
9	Athiparasakthi V	Fastlab	Non-Core	500,000.00
10	Dhulasi Vinothini K S	Wood	Core	420,000.00
11	Gaddam Padmapriya	Keyence	Non-Core	471,760.00
12	Harish R	Sureti	Non-Core	450,000.00
13	Jahnavi N	Dow Chemicals	Core	850,000.00
14	Kanmani K	Pickyourtrail	Non-Core	430,000.00
15	Kasi Viswanathan R	SPIC	Core	264,000.00
16	Kaushalya R	Sureti	Non-Core	450,000.00
17	Krishna Poorani M	Wood	Core	420,000.00
18	Logavan A	Infosys	Non-Core	350,000.00
19	Madhumitha S	Technip	Core	480,000.00
20	Manikandan S	McDermott	Core	500,000.00
21	Medheer Gautam	McDermott	Core	500,000.00
22	Ponprasath R	TCS	Non-Core	350,000.00
23	Prasanna Kumar	Technip	Core	480,000.00
24	Sakthivel N	CTS	Non-Core	400,000.00
25	Savitha	CTS	Non-Core	400,000.00
26	Siddarth N	CTS	Non-Core	400,000.00
27	Swaanika L	ZoomRx	Non-Core	550,000.00
28	Tharun vijay M	Tamilnad Petro Products	Core	258,000.00

29	Vigneswaran S	SPIC	Core	264,000.00
30	Gopinath S	Syngene	Core	306,364.00
31	Karthikeyan S	Sureti	Non-Core	450,000.00
32	Kevin A	Sureti	Non-Core	450,000.00
33	Praveen C	Syngene	Core	306,364.00
34	Samuel V	Tamilnad Petro Products	Core	258,000.00

Online Internships, Courses & Webinars Attended by Students

Name of the Student	Internships/Courses/Webinars Attended	Organized/offered by
B.Aishwarya (II year, B.Tech)	International Webinar on "Carbon Footprint - Challenges Ahead"	Indian Institute of Chemical Engineers - SSN
Joshua.T (II year, B.Tech)	International Webinar on "Carbon Footprint - Challenges Ahead"	Indian Institute of Chemical Engineers - SSN

FACULTY ACTIVITIES

External Fund Received

Congratulations to Dr. P. Senthil Kumar, Associate Professor, Chemical Engineering, for securing a grant of Rs. 63.29 Lakhs for the project entitled, "Electrochemical sensing of sulfamethoxazole antibiotic in water at GO/ZnO Nanocomposites-modified electrodes: Optimization and Real time measurement" sponsored by DST, Govt. of India.

Paper Publications

1) Comparative performance analysis of electrospun TiO_2 embedded poly (vinylidene fluoride) nanocomposite membrane for supercapacitors, R. Arthi , V. Jaikumar, P. Muralidharan, Journal of applied polymer science 2020, Clarivate: 2.52, https://doi.org/10.1002/app.50323

2) Investigation of Magnetic Silica Nanocomposite Immobilized Pseudomonas fluorescens as a biosorbent for the effective sequestration of Rhodamine B from aqueous systems, G. Janet Joshiba, P. Senthil Kumar*, M. Govarthanan, P. Tsopbou Ngueagni, A. Abilarasu, Femina Carolin C, Environmental Pollution, Vol. 269, pp. 116173, 2021, Clarivate: 6.792
3) A review on critical assessment of advanced bioreactor options for sustainable hydrogen production Femina Carolin C, P. Senthil Kumar*, Dai-Viet N. Vo, G. Janet Joshiba, International Journal of Hydrogen Energy, 2020, Clarivate: 4.939, https://doi.org/10.1016/j.ijhydene.2020.11.244
4) Occurrence and removal of antibiotics from industrial wastewater, D. Akhil, Divya Lakshmi, P. Senthil Kumar*, Dai-Viet N. Vo, A. Kartik, Environmental Chemistry Letters 2020 Clarivate, 5.992, https://doi.org/10.1007/s10311-020-01152-0
5) Recent Developments in Photocatalytic Remediation of Textile Effluent using Semiconductor based Nanostructured Catalyst: A Review, J. Ambigadevi, P. Senthil Kumar*, Dai-Viet N. Vo, S. Hari Haran, T.N. Srinivasa Raghavan, Journal of Environmental Chemical Engineering, 2020, Clarivate: 4.3, https://doi.org/10.1016/j.jece.2020.104881
6) Enhanced photocatalytic degradation of diclofenac by Sn0.15Mn0.85Fe2O4 catalyst under solar light A. Abilarasu, P. Senthil Kumar*, Dai-Viet N. Vo, D. Krithika, P. Tsopbou Ngueagni, G. Janet Joshiba, Femina Carolin C, G. Prasannamedha, Journal of Environmental Chemical Engineering, Vol. 9(1), pp. 104875, 2021, Clarivate: 4.3
7) Effective removal of naphthalene from contaminated soil using halotolerant bacterial strains and vermiremediation techniques, Reshma Bhandari, Kilaru Harsha Vardhan, P. Senthil Kumar*, K. Veena Gayathri*, International Journal of Environmental Analytical Chemistry, 2020, Clarivate: 1.431, https://doi.org/10.1080/03067319.2020.1863390
8) Enhanced Adsorptive Removal of Sulfamethoxazole from Water using Biochar Derived from Hydrothermal Carbonization of Sugarcane Bagasse, G. Prasannamedha, P. Senthil Kumar*, R. Mehala, T.J. Sharumitha, D.Surendhar, Journal of Hazardous Materials Vol. 407, pp. 124825, 2021, Clarivate: 9.038

9) A Review on New Aspects of Lipopeptide Biosurfactant: Types, Production, Properties and its Application in the Bioremediation Process Femina Carolin C, P. Senthil Kumar*, P. Tsopbou Ngueagni, Journal of Hazardous Materials, Vol. 407, pp. 124827, 2021, Clarivate: 9.038
10) Effective removal of excessive fluoride from aqueous environment using activated pods of Bauhinia variegata: Batch and dynamic analysis D. Eunice Jayashree, P. Senthil Kumar, P. Tsopbou Ngueagni, Dai-VietN. Vo, Kit Wayne Chew, Environmental Pollution, 2020, Clarivate: 6.792, https://doi.org/10.1016/j.envpol.2020.115969
11) Hydrothermal production of algal biochar for environmental and fertilizer applications: A review, V. Karthik, P. Senthil Kumar*, Dai-Viet N. Vo, J. Sindhu, D. Sneka, B. Subhashini, K. Saravanan, J. Jeyanthi, Environmental Chemistry Letters, 2020, Clarivate: 5.992, https://doi.org/10.1007/s10311-020-01139-x
12) Formulation and combinatorial effect of Pseudomonas fluorescens and Bacillus coagulans as biocontrol agents, P. R. Yaashikaa, P. Senthil Kumar*, Sunita Varjani, S. Tamilselvi, A. Saravanan, Biocatalysis and Agricultural Biotechnology Vol. 30, pp. 101868 2020, Scopus, https://doi.org/10.1016/j.bcab.2020.101868
13) Theoretical analysis of the heat transfer effect of viscoplastic nanofluids in process intensified chemical systems, S. Mullai Venthan, I. Jayakaran Amalraj, P. Senthil Kumar, Chemical Engineering and Processing: Process Intensification, 2020, Clarivate: 3.731, https://doi.org/10.1016/j.cep.2020.108227
14) Characterization and Optimization of process parameter for Pharmaceutical waste management and disposal by using Nano Zero Valent Iron impregnated agricultural waste from aqueous solution, D. Prabu*, P. Senthil Kumar, G. Narendrakumar, S. Sathish, Research Journal of Pharmacy and Technology, Vol. 13(11), pp. 5306-5312 2020, Scopus, 10.5958/0974-360X.2020.00928.2
15) Critical review on removal of toxic pollutants using biochar: Techniques, characterization, stability and circular bioeconomy, P. R. Yaashikaa, P. Senthil Kumar*, Sunita Varjani, A. Saravanan, Biotechnology Reports, 2020, Scopus
16) A critical review on global trends in biogas scenario with its up-gradation technique for fuel cell and future perspectives, D. Thiruselvi, P. Senthil Kumar*, M. Anil Kumar, Chyi-How Lay, Salma Aathika, Y. Mani, D. Jagadiswary, A. Dhanasekaran, P. Shanmugam, S. Sivanesan, Pau-Loke Show, International Journal of Hydrogen Energy, 2020, Clarivate 4.939, 10.1016/j.ijhydene.2020.10.023,

17) A Review on biosynthesis of metal nanoparticles and its environmental applications, A. Saravanan, P. Senthil Kumar*, S. Karishma, Dai-Viet N. Vo, S. Jeevanantham, P.R. Yaashikaa, Cynthia Susan George, Chemosphere, Vol. 264, pp. 128580 , 2021, Clarivate, 5.778, 10.1016/j.chemosphere.2020.128580.

18) Sequential production of hydrogen and methane by anaerobic digestion of organic wastes: A review, Salma AathikaAbdur Rawoof, P. Senthil Kumar*, Dai-Viet N. Vo, Sivanesan Subramanian, Environmental Chemistry Letters, -, 2020, Clarivate, 5.992, 10.1007/s10311-020-01122-6.

19) Food preservation techniques and nanotechnology for increased shelf life of fruits, vegetables, beverages and spices: a review, A. Sridhar, M. Ponnuchamy, P. Senthil Kumar*, Ashish Kapoor, Environmental Chemistry Letters, 2020, Clarivate, 5.992, 10.1007/s10311-020-01126-2.

20) Conversion of waste plastics into low emissive hydrocarbon fuel using catalyst produced from biowaste, N. Jahnavi, K. Kanmani, P. Senthil Kumar* Sunita Varjani, Environmental Science and Pollution Research, -, 2020, Clarivate, 3.056, 10.1007/s11356-020-11398-4.

21) A review on effective removal of emerging contaminants from aquatic systems: current trends and scope for further research, B. Senthil Rathi, P. Senthil Kumar*, Pau-Loke SHOW, Journal of Hazardous Materials, 2020, Clarivate, 9.038, 10.1016/j.jhazmat.2020.124413.

22) Experimental investigation on water absorption capacity of RHA-added cement concrete, Ambedkar Balraj, Dhanalakshmi Jayaraman, Jagannathan Krishnan, and Josephin Alex, Environmental Science and Pollution Research, 2020, Clarivate, 3.05, 10.1007/s11356-020-11339-1

23) Experimental investigation of density, viscosity, and surface tension of aqueous tetrabutylammonium-based ionic liquids, Muthumari Perumal & Ambedkar Balraj & Dhanalakshmi Jayaraman & Jagannathan Krishnan, Environmental Science and Pollution Research, 1-15, 2020, Clarivate, 3.056, 10.1007/s11356-020-11174-4.

24) Effective removal of naphthalene from contaminated soil using halotolerant bacterial strains and vermiremediation techniques Reshma Bhandari, Kilaru Harsha Vardhan, P. Senthil Kumar and K. Veena Gayathri, International Journal of Environmental Analytical Chemistry 202, Scopus, 10.1080/03067319.2020.1863390

Book Chapters Published

1) Treatment of Dye Containing Wastewater Using Agricultural Biomass Derived Magnetic Adsorbents, A. Saravanan, P. Senthil Kumar, and P. R. Yaashikaa, Mu. Naushad and Eric Lichtfouse, Springer 38 and 149-170 https://doi.org/10.1007/978-3-030-17724-9_7
2) An Elective Strategy for Wastewater Treatment: An Eco-Friendly Approach, A. Saravanan, P. Senthil Kumar and P. R. Yaashikaa, CRC Press 1-16 ISBN: 978-0-367-18739-2
3) Advancements in Recycled Polyesters, A. Saravanan and P. Senthil Kumar, Springer pp. 31-48 https://doi.org/10.1007/978-981-13-9578-9_2
4) Case Studies on Recycled Polyesters and Different Applications, P. Senthil Kumar and P. R. Yaashikaa, Springer pp. 85-99 https://doi.org/10.1007/978-981-13 9578-9_4
5) Solid waste biorefineries, A. Saravanan, R.V. Hemavathy, T.R. Sundararaman, S. Jeevanantham, P. Senthil Kumar and P.R. Yaashikaa, Elsevier pp. 3-18, https://doi.org/10.1016/B978-0-12-818996-2.00001-6
6) Sources and operations of waste biorefineries, P. Senthil Kumar and P.R. Yaashikaa, Elsevier pp. 111-134 https://doi.org/10.1016/B978-0-12-818996-2.00005-3
7) Food industry waste biorefineries, P. Senthil Kumar, A. Saravanan, R. Jayasree and S. Jeevanantham, Elsevier pp. 407-426, https://doi.org/10.1016/B978-0-12-818996 2.00018-1
8) Properties of Recycled Polyester, P. Senthil Kumar and G. Janet Joshiba Springer pp. 1-14 https://doi.org/10.1007/978-981-32-9559-9_1
9) Test Methods and Identification of Recycled Polyester, P. Senthil Kumar and S. Suganya, Springer pp. 69-88 https://doi.org/10.1007/978-981-32-9559-9_4
10) Recent trends and challenges in bioleaching technologies, P. Senthil Kumar and P.R. Yaashikaa, Elsevier pp. 373-388, https://doi.org/10.1016/B978-0-12-817951-2.00020-1
11) Membrane separation technologies for downstream processing, A. Saravanan, P. Senthil Kumar, R. Jayasree, S. Jeevanantham, Elsevier pp. 389-400 https://doi.org/10.1016/B978-0-12-817951-2.00021-3
12) Sustainability in Dyeing and Finishing, P. Senthil Kumar and G. Janet Joshiba, Springer pp. 165-178 https://doi.org/10.1007/978-3-030-38545-3_7
13) Sustainability in the Spinning Process, P. Senthil Kumar and G. Janet Joshiba, Springer pp. 197-208 https://doi.org/10.1007/978-3-030-38545-3_9
14) Chemical compliance and regulations in textiles and fashion, G. Prasannamedha and P. Senthilkumar, Elsevier pp. 135-155, https://doi.org/10.1016/B978-0-12-820494-8.00007-1

15) Biosorptive Removal of Toxic Pollutants from Contaminated Water A. Saravanan and P. Senthil Kumar, Springer pp. 213-224, https://doi.org/10.1007/978-3-030-48985-4_9
16) Environmental and Chemical Issues in Tanneries and Their Mitigation Measures, P. Senthil Kumar and G. Janet Joshiba, Springer pp. 1-10, https://doi.org/10.1007/978-981-15-6296-9_1
17) Certifications for Sustainability in Footwear and Leather Sectors,P. Senthil Kumar and C. Femina Carolin, Springer pp. 181-198, https://doi.org/10.1007/978-981-15 6296-9_8
18) Valorization of Waste Algal Boom for Value-Added Products, A. Annam Renita and P. Senthil Kumar, Springer pp. 129-137,https://doi.org/10.1007/698_2020_579
19) Enzyme Inhibition in Therapeutic Applications, A. Saravanan*, R. Jayasree, T.R. Sundaraman, R.V. Hemavathy, S. Jeevanantham, P. Senthil Kumar, P. R. Yaashikaa, Bentham Science, pp. 5-16
20) Analytical Aspects of Biosensor Based on EnzymeInhibition, A. Saravanan*, S. Jeevanantham, P. Senthil Kumar, P. R. Yaashikaa, Bentham Science pp. 17-35
21) Modern treatment strategies for marine pollution, P. Senthil Kumar Elsevier, 1-212, ISBN: 978-0-12-822279-9

Guest lectures, Workshops and Webinars Organized

1) Dr. R. Parthiban & Dr. D. Balaji, IIChE Coordinator organized an international webinar on "Carbon Footprint – Challenges Ahead" delivered by Dr. N Venkataraman, Principal Consultant, Fides Global Pte Ltd, Singapore 048616 on 06.11.2020. Eighty eight faculty, scholars, students attended the webinar.

2) Dr. R. Parthiban & Dr. D. Balaji, IIChE Coordinator organized a guest lecture titled "Compressors in Process Plants" delivered by Mr. S R Mohan Raaj, Regional Manager (Southern Region) & Mr. M Karthikeyan, Territory Manager (Sales), Kaeser Compressors (India) Pvt. Ltd, Chennai on 05.10.2020 held Via Online platform" for "II, III, IV Year of study of students" under the banner of "IIChE-SSN Student Chapter". One seventy-five students attended the webinar.

3) Dr. P. Senthil Kumar ASP, organized an International Webinar on "Technological Advances in Waste Biomass Conversion to Biofuels" dated 19-12-2020. This event is organized by The IEI Students Chapter Chemical Engineering, Department of Chemical Engineering, SSN College of Engineering, Chennai, India, in Association with Institution of Engineers (India).

Awards

1) Congratulations to Dr V Jaikumar, Associate Professor, for receiving Vedant Educator Excellence Award 2020 from Vedant Foundation on 15 Oct 2020.

2) Congratulations to Dr. P. Senthil Kumar, Associate Professor, for being ranked amongst top 1% in the Chemical Engineering field securing 498th position in the world; 22nd position in India and 12440th position in the world irrespective of the particular research field based on the analysis done by Stanford University, United States. (Link: For methodology and data by Stanford University scientists, visit: https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000918, Please refer to the attachment for the details, S.No. 322).

External Recognition

1) Dr V Jaikumar, ASP, gave a Guest lecture in the Centre for Waste Management-IRC, Faculty Development Programme on Waste Audit and Management for Fuel/Value Added Materials Recovery, Sathyabama University on the topic **Waste Recycling** on 11-12-2020

2) Dr. K. Jagannathan, ASP, delivered an invited guest lecture on "**Advanced Oxidation Processes for Wastewater Treatment**" in the 6-day AICTE sponsored Short Term Training Programme - Webinar Series 3: "Wastewater Treatment and Characterization Techniques - Hands on Experience" organized by Department of Chemical Engineering, Manipal Institute of Technology, Manipal, Karnataka on 18 Dec 2020.

3) Dr. P. Senthil Kumar, ASP, has been nominated as an Associate Editor in the prestigious Journal "Ecological Processes", Thomson Reuters IF: 1.642, Springer Publisher.

4) Dr. P. Senthil Kumar, ASP, acted as Subject Expert for the Ph.D. thesis titled "**Investigation on metal oxide nanoparticles doped polyvinyl alcohol nanocomposite films**" for the candidate Ms. J. Selvi, Hindustan Institute of Technology & Science, Chennai.

5) Dr.P. Senthil Kumar ASP, delivered an invited technical lecture on "**Research Aspects of Adsorption Technology in Wastewater Treatment**" at the department of Chemical

Engineering, Pondicherry Engineering College, Pondicherry on 17.11.2020. This is an invited lecture was delivered in the AICTE Sponsored Short Term Training Program (STTP) On "Recent Advances in Separation Processes (RASP)" November 12th – November 19th, 2020 organized by Pondicherry Engineering College, Pondicherry.

6) Dr.P. Senthil Kumar ASP, delivered a guest lecture on "Research Aspects of Wastewater Management in Automobile Industrial Sectors" at Five Days online Workshop on "**Advances in Functional & Modern Materials for Automobile Applications**" organized by SAEINDIA Southern Section on 27-10-2020.

Viva-voce & DC meetings

1) Dr. R. Parthiban's Part Time PhD research scholar, Mr. D. Sivakumar submitted his thesis on 24.12.2020
2) Dr. V. Jaikumar, ASP, conducted Synopsis DC Meeting for his PhD Scholar, Mrs R Arthi on 21-12-2020
3) Dr V Jaikumar's PhD Scholar, Mrs Grace Pavithra submitted Thesis to Centre for Research, Anna University after carrying out scrutiny corrections on 23-12-2020.
4) Dr. D. Balaji, ASP, conducted the SYNOPSIS DC Meeting for his part-time research scholar, Mr Gnanasekaran R (Reg. No. 17145991151) on 11.11.2020.
5) Dr. V. Jaikumar's PhD Scholar, Mrs Grace Pavithra submitted Thesis to Centre for Research, Anna University on 30-11-2020.
6) Dr. R. Parthiban, Professor, conducted the synopsis meeting for his Full Time Ph D scholar, Ms Eswary Devi held on 10.11.2020
7) Dr. V. Jaikumar, ASP, conducted the SYNOPSIS DC Meeting for his full-time research scholar, Ms. K. Grace Pavithra (Reg.No.17245997108) on 05.10.2020.
8) Dr. D. Gnana Prakash, ASP, conducted the synopsis DC meeting for his full-time research scholar, Mr. S. Balachandran on 28.10.2020.

Online FDP, Webinar & Courses Attended

S.No	Name of the faculty	Details of webinar/ FDP/Course	Organised by/ Offered by
1	 Dr.V.Jaikumar Associate Professor	Artificial Intelligence with Machine Learning tools	MSME Technology Development Guindy, Chennai on 30-10-2020
2		Waste Technology	ATAL Academy, Govt. of India from 02–6 Nov 2020
3		Developing Entrepreneurial Students for Future	Anna University, from 04 - 06 Nov 2020.
4		Technological Advances in Waste Biomass Conversion to Biofuels	University of Saskatchewan Saskatoon, Canada on 19-12-2020.
5	 Dr. P. Senthil Kumar Associate Professor	Green Technology & Sustainability Engineering	Dr BR Ambedkar National Institute of Technology, Jalandhar from 19-23 Oct 2020
6	 Dr.D.Balaji Associate Professor	Computational Fluid Flow and Heat Transfer	Gayatri Vidya Parishad College of Engineering, Kakinada from 09.11.2020-14.11.2020
7		Recent Advances in Separation Processes	Pondicherry Engineering College, Puducherry from 12.11.2020-19.11.2020.
8		Development of Chemical Engineering Thermodynamics Laboratory for Undergraduates	GIET University, Gunpur, Odisha from 14.12.2020-19.12.2020.
9		Waste audit and management for fuel/value added materials recovery	Sathyabama Institute of Science and Technology, Chennai from 08.12.2020-12.12.2020
10		Research Problem	Kalasalingam Academy of Research and Education, Krishnankoil in Association with Kamala Nehru Mahavidyalaya, Nagpur on 05-10-2020.

11		Organic Synthesis and Research Publication	Annamalai University, Annamalai Nagar 608 002 on 22-10-2020.
12		Top 7 Important Elements in High Impact Scientific Research Paper Writing	Aristocrat IT Solutions Pvt Ltd. on 30-10-2020
13	 Dr. Kilaru Harsha Vardhan Associate Professor	Recent Trends in Waste Management Technologies	Department of Petrochemical Technology, UCE- BIT Campus, Anna University, Tiruchirappalli, October 12 – 16, 2020
14		Sensor Interfacing and Controller Implementation in Engineering Systems	Department of Electronics and Instrumentation, Saveetha Engineering College, Chennai, November 23 to 28, 2020
15		Finite Element Analysis using ANSYS	Department of Mechanical Engineering, University College of Engineering, Anna University-BIT Campus, Tiruchirappalli during 30.12.2020 to 05.12.2020
16		Modern Optimization Tools in Engineering Field-V	Electronics and Instrumentation Engineering, SRM Valliammai Engineering College (Autonomous), Chennai from 07.12.2020 to 12.12.2020
17		Strategies in Teaching Learning	Mechanical Engineering, Sri Sai Ram Institute of Technology, Chennai, 14-19 Dec 2020,

Tech Advancements

A PAINT THAT KILLS COVID-19 WITH Cu+1

COVID-19 infection and hospitalization rates in the US shot back up in early November, closing bars, preschools, and other public amenities across the country. Public health officials are reemphasizing the cornerstone roles that handwashing, masks, and social distancing have in combating the pandemic.

At the same time, the home-care industry has been hard at work bringing new and existing cleaning products to the fight. The US Environmental Protection Agency's List N, which contains all the products the agency permits to claim the ability to kill SARS-CoV-2 on surfaces, has grown from 200 entries in March to 508 in mid-November.

The EPA recently emphasized the need to supplement those efforts with surfaces and surface treatments that provide long-lasting activity against viruses and other microbes. In October, the agency issued guidance on how companies can prove a product's efficacy against SARS-CoV-2 before making such claims, a move EPA administrator Andrew Wheeler says in a news release would provide "an expedited path for our nation's manufacturers and innovators to get cutting-edge, long-lasting disinfecting products into the marketplace as safely and quickly as possible."

Elemental copper provides permanent antimicrobial activity, but large surfaces clad in copper are expensive and not the right look for most places. To bring the disinfecting power of copper to a broader range of walls, handrails, and other surfaces around the home and workplace, Corning developed a copper-containing biphasic glass-ceramic material it calls Guardiant and worked with PPG Industries to incorporate it into a line of latex paints called Copper Armor.

"The overall idea here was to create a material that maintains the antimicrobial potency of copper while getting rid of its metallic character and metallic look so that it could be incorporated into a wide variety of materials and surfaces," says Joydeep Lahiri, vice president of Corning's specialty surfaces division. Though the pure Guardiant material is a pale blue-green powder, PPG was able to flex its formulation experience to make the paint in all the normal shades and sheens.

Cu^{+1} is the active antimicrobial form of the element. The challenge that Corning's technology solved, Lahiri says, was keeping the copper in that oxidation state while also letting it get to the microbes. In April 2019, the firms published a paper in *Nature Communications* on their innovation, which they describe as an "alkali copper aluminoborophosphosilicate glass ceramic material that acts as a sustainable delivery system for Cu^{+1} ions" (DOI: 10.1038/s41467-019-09946-9).

As the publication date testifies, the firms were working together on the technology before the pandemic hit. But the novel coronavirus accelerated the formulation and commercialization work, says Eric Stevenson, director of product management for architectural coatings at PPG. "The COVID pandemic has heightened everyone's awareness of viruses and bacteria and how quickly they spread," he says.

The R&D team found literature describing the use of glass to keep copper in the +1 state, Lahiri explains. But in the team's tests, paint incorporating a copper-glass phase wasn't effective against pathogens, probably because the copper couldn't escape the glass to do any microbe killing. Replacing some of the aluminum oxide in the glass with boron, phosphorus, and potassium oxides created a second phase in the material that is more water labile. Paint made with the biphasic ceramic-glass copper material reduced counts of SARS-CoV-2 as well as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella aerogenes*, and *Escherichia coli* on the surface by more than 99.9%, matching an efficacy previously achieved by metallic copper using EPA test standards.

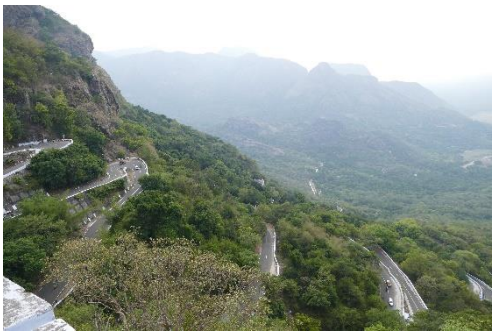
In fact, Lahiri says, the firms went beyond the industry standard tests, which analyse the kill rate under warm, wet conditions. The paint also got a kill rate of 99.9% while dry at room temperature, much more like what it would see in a real-world setting.

Though it may seem like the water-labile phase would wash away during cleaning before long, Stevenson says PPG's wear-simulation tests suggest that the antimicrobial action will stand up to more than 5 years of scrubbing and still meet that 99.9% kill standard. The firms are awaiting EPA approval and expect the paint to hit the market in the next few months.

Courtesy: Chemical & Engineering News

WRITE-UPS

WHAT IS WRONG WITH DRAFT EIA 2020?



The Draft EIA of 2020 has attracted a lot of attention and not in a favourable way, as the government would have hoped. From blocking websites that were actively campaigning against the draft to restricting several Instagram accounts for having campaigning links on their bios, a different aspect of 'Digital India' has confronted environmentalists in the past few weeks. Rather than finding common ground, the government has tried to dub those who have stood by the environment as anti-nationalists. By going forward with this assault on the environment and only calculating the monetary benefits of projects rather than implementing a sustainable model of development, which is the need of the hour, this government is betraying the sense of nationalism that got it elected in 2019. There are many reasons why this draft notification is a cause of concern, a few of which have been highlighted in this essay.

The very essence of a free democracy is one's ability to freely voice their opinions and thoughts. This was provided for, though loosely defined, in the 2006 notification of the EIA. Apart from the fact that B2 projects no longer require public consultation, now, projects that are likely to expand by less than 50% of their original area are exempted from any sort of public consultation. Even for projects for which public consultation is 'welcomed', only those persons who have 'stakes in the projects' are allowed to raise objections. Road and highway projects would not require public consultation, which is a cause of concern. Though the Government's stance will be that they are laying these roads 'for the people', it is extremely important to factor in the concerns of the local people and environmentalists when such projects are under consideration. Another red flag is the proviso that states that only a project's proponents and government authorities can report environmental violations by the project after the issuance of its EIA. It makes no sense to trust violators to come clean on the violations they have committed. In the interest of transparency, something the government claims to value, the public must be allowed to report violations by industries.

In the preparation of the EIA lies another issue: data collection. In previous notifications, there was no set time frame in which the EIA was to be made. With this type of structure, EIAs were generated in a way that was favourable for industries. This has been made simpler in the current notification. With the exception of EIAs for river projects (these require one year's worth of data), an EIA can be generated with the data collected from any one season besides the monsoon season. This can lead to a lot of EIAs with data that doesn't truly represent the diversity and ecological significance of a location. Let me elucidate this with an example. Let us assume that a project is to be sanctioned and the proposed site is a well-known bird sanctuary. The bird sanctuary is well known for hosting thousands of wintering waterfowl, storks and various other species. However, if the data from summer is used to generate the EIA, the wintering data will be lost. Thus, what should be valued as an ecological hotspot will be reflected as a wasteland in the EIA. Though arguments can be made that there have been such irregularities in EIAs done in the past, a new

draft must always solve the issues that exist and not aggravate them. There seems to be confusion even with the prepared EIA. From the wording, it seems to imply that only a summary of the EIA for a project will be released and not the complete report. Since it is unclear what parts would be deemed important enough to mention in this summary, this clause is another red flag in this draft. This is weird for a government that prides itself on transparency.

The exclusionary nature of the EIA is another cause for concern. One of the 40 industries that have been exempted from requiring EIAs is the highly polluting construction industry. The draft of 2020 stipulates that only the largest construction projects need to be fully scrutinised while others can avoid appraisal. Apart from these, certain road construction projects have been included under the B2 category of projects and would therefore not require EIAs. For example, highways projects that have expansions of less than 100km don't require an EIA anymore. Along these lines lies a deeper issue of land acquisition. According to the draft, industries are allowed to occupy and cordon off land even before the environmental clearance is issued. This is illegal by several state laws and can lead to serious land grabbing issues in the future. Expansion projects of up to 25%, don't require an EIA under the new regulations. While this might sound reasonable, a large project that already takes up 4000 acres of land can add 1000 acres of land without having to get an EIA, which is ludicrous.

Apart from the environmental aspect, if revisions are taken up by the government, an avenue that must be explored is the role of indigenous persons in granting ECs. In rural setups, the role of gram sabhas must be instrumental in granting ECs, as should be the views of the panchayath under whose jurisdiction the proposed industry is to be set up. More than the activists who fight for these causes, it is the local people who will be immediately affected by the lack of representation. It is imperative that this wrong that has been ignored all these years is corrected in the next phase of environment legislation.

In my opinion, it's time that legislation for the EIA is passed through parliament. This legislation must be in accordance with the Rio declaration of which India is a signatory. This must be written

with inputs from indigenous people, environmentalists and co-operatives to ensure that everyone's interests are considered and the nation's natural resources are well protected. It was Mahatma Gandhi, the father of the nation and the driving force of the **Swachh Bharath** campaign who stated that there was enough for every man's need, but not for every man's greed. We all hope that the government will take in suggestions and start afresh with the EIA draft. Let us work towards a sustainable India and a nation which can be a model for development, which allows for the peaceful coexistence of humans and nature. This is the nation I dream of and the future for which we should fight.

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BIOCHEMICAL INDUSTRY: AN OVERVIEW

The field of biochemical engineering and the inherent processes are widely applied in sectors ranging from chemical and pharmaceutical to energy and biotechnology. It not only concerns the application of microorganisms in obtaining biological products, but also design, construction and advancement in unit operations. The characteristics of each microorganism are different and it is important to understand the utility and function of each. Different products are obtained by using different microorganisms for the same substrate and reaction conditions. There are high scope and benefits to employing bioprocesses in chemical industries for effluent treatment and hybrid systems. Methods have been formulated to treat wastewater biochemically, enabling them to be fit for reuse

and/or consumption. These processes are used to prepare feedstock through sterilization, separation through cell membranes and renewable alternatives for energy which are immensely pertinent given the current situation.

There's a need to make biochemical processes more economic by identifying constraints like slow reaction rate, maintaining a sterile environment, batch incubation, separation challenges, disinfection and prevention of biohazards. There are several different types of bioreactors in usage depending on the nature of feed and process. Biohydrogen production is currently under intense discussion owing to its highly advantageous properties as a clean source of fuel. There are countless applications of chemicals both directly and indirectly in every frame of life, especially with the accelerated urbanization and need of resources, globally- petrochemicals, organic and inorganic, fertilizers, paints, pigments, dyes, specialty chemicals, agrochemicals, tanning among a million others.

Fermentation is one of the chief processes that contribute to the food industry, beverage industry, water treatment plants and biofuel manufacturing. The anaerobic pathways of different substrates vary by the strain of microorganism in use. There are successive growth phases of microorganisms in general, Lag Phase, Log Phase, Stationary Phase and Death Phase. The constraints in a process are typically pH, ionic strength, moisture content, redox potential, nutrient composition, structure, temperature and dissolved oxygen content. Mathematical models have been formulated to estimate the growth rates, decay rates, reaction rates and time-dependent concentrations of the substrate to

determine the precise development of the microorganism or enzyme. Fermentation kinetics throw light on the optimal duration of the process and yield. Biofuels and fuel cells are key to help regress global warming and climate change, and these involve biochemical processes that are essential in their production as they not only limit emission of harmful greenhouse gases, but also utilize materials that are otherwise disposed of as waste. In an industry or factory, there often arise issues that must be tackled scientifically and systematically. This requires a methodical way of troubleshooting that identifies, addresses and fixes the problem effectively. Optimization needs to be done to maximize benefit with high output efficiency and thus ensuring the cost-benefit ratio is high. All in all, the biochemical industry plays a very vital part in very many disciplines and sectors.

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MEATLESS MEAT

Meat production is destroying our planet and threatening global health. On our current track, we are going to need to be producing 70 – 100% more meat by 2050. Animal agriculture is responsible for 91% of Amazon forest destruction. Farm animals are fed with massive doses of antibiotics which tends to climate change and antibiotic-resistant superbugs. Convincing the world to eat less meat hasn't worked. So here is the solution – MEATLESS MEAT. Let's grow meat

from plants. But meat production will not be decreased unless the consumers are supplied with an alternative that costs the same or less and tastes the same or better.

Meat alternatives are promoted for their environmental, animal welfare, and public health benefits. In recent times, some companies have been producing meat from plants with soybean and gluten as their raw material. But current research reveals that soy may promote the growth of cancer cells and impair fertility. The side effects of gluten can range from mild (fatigue, bloating, alternating constipation and diarrhoea) to severe (unintentional weight loss, malnutrition, intestinal damage) as seen in the autoimmune disorder celiac disease. While considering the downside of soy and gluten, Jackfruit serves as an excellent alternative. Jackfruit is nature made plant-based meat. This versatile giant fruit is native to India and is drought and pest resistant. One of the biggest challenges of plant-based meat is recreating its muscular structure, so jackfruit offers a simple solution. Adding Shitake mushrooms, a high protein fungus gives a meaty flavour and improves the protein value. The targeted protein value is 25 g per 100 g of jackfruit plant-based meat which is approximately equal to that of animal meat.

Meat production is guiding us to global emergencies. The miracle food, jackfruit, has a powerful story of improvising healthy eating, farmer's livelihood and humanity's eco-footprint. Its past time that we mobilize to create the next global revolution. Let's make the difference!!

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EATING WITH OUR EYES: FOOD COLOR PSYCHOLOGY AND RED SPELLS DANGER

Eating involves more than just taste. It is a full sensory experience. Both food scientists and chefs will tell you that the smell, sound, feel, and, yes, the sight of our food are just as important as taste to fully appreciate what we eat. Colour is the single most important product-intrinsic sensory cue when it comes to setting our expectations regarding the likely taste and flavour of food and drinks. Colour creates a psychological expectation for a certain flavour that is often impossible to dislodge. The link between colour and taste is logical. Colour psychology has been used in food marketing for a long time. Red is the colour most used by fast food chains, followed closely by yellow and orange. Yellow and orange are colours that make people feel hungry. The colour red is associated with emotion and passion. So, when one sees red combined with yellow and orange, they become passionately hungry. In contrast, blue colour foods are appetite suppressant and reduce hunger.

Natural dyes have been used for centuries to colour food. Some of the most common ones are carotenoids, chlorophyll, anthocyanin, and turmeric. Bugs, anyone? An extract from a type of insect, known as the cochineal, was deliberately added by the food manufacturer (in strawberry-flavoured yogurt or juice). For centuries, the Aztecs used these insects to dye fabrics a deep-red colour. If we crush up 70,000 of these bugs, we can extract a pound of a deep-red dye, called carminic acid ($C_{22}H_{20}O_{13}$) but this dye is safe to ingest.

Artificial food dye consumption has increased by 500 percent in the last fifty years because it cost efficient and has longer shelf life. In recent research some red dyes have proven to be carcinogenic and might instigate other diseases. Allura Red AC (E129) is an azo dye that widely used in drinks, juices, bakery, meat, and sweets products. High consumption of Allura Red has claimed an adverse effect of human health including allergies, food intolerance, cancer, multiple sclerosis, attention deficit hyperactivity disorder, brain damage, nausea, cardiac disease and asthma due to the reaction of aromatic azo compounds. Allura Red is able to reduce by azoreductase enzymes in intestinal bacteria and in liver cells with the release of aromatic amines to the organism that caused frequent headaches in adults while children often become distracted and hyperactive. Erythrosine is a cherry-pink synthetic food colorant with a polyiodinated xanthene structure. It is widely used to colour children's sweets. Some studies suggested a relationship between Erythrosine consumption and altered cognition and behaviour in children, which could be due to the inhibition of dopamine receptors. Moreover, different studies suggested the induction of chromosome aberrations and an increase in the incidence of thyroid tumours by Erythrosine consumption. Although food dyes constitute a considerate part of the food industry, there are certain dyes that are to be avoided. The use of organic dyes could very well improve the safety aspects; but certain improvements, particularly in the aspect of shelf life requires more research. New organic dyes made of spirulina concentrate and colouring pigments called auronidins have caught the attention of the industry and hopefully there will be a 'vibrant' future with harmless, organic food dyes.

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BUSINESS POTENTIAL OF CARBON CAPTURE TECHNOLOGIES

Human activities have increased the atmospheric concentration of CO_2 to 47% above the pre-industrial level, this is higher than what happened naturally over 20,000 years (Climate, NASA). Huge quantities of flue gas from coal fired power plants containing 14 - 16% CO_2 is released into atmosphere. CO_2 is becoming a critical part to keep climate change in check. However, Carbon Capture and Sequestration (CCS) applied to a modern conventional power plant could reduce CO_2 emissions to the atmosphere by approximately 80–90% compared to a plant without CCS.

Paris Agreement in 2015 aimed to limit global warming to below 2°C by cutting on emissions. But limited progress has been made on the carbon capture technologies till now, with efforts focused on cutting emissions rather than taking carbon out of the air. Worldwide, more entrepreneurs are investing on these budding technologies to combat global climate change. Climeworks, a Swiss based company is the world's leading Direct Air Capture (DAC) company and has raised $75 million for carbon capture. Carbon Engineering, a company backed by Bill Gates, Chevron, BHP, and Occidental is working on capturing CO_2 and converting it into fuel. Formed in 2010, Global Thermostat (GT) is commercializing its advanced, multi-patented technology to economically capture and reuse CO_2. In India, Reliance Industries Chairman Mukesh Ambani aimed to turn net carbon emission zero by 2035 in Reliance industries. Few countries like Norway and US have tried investing in algae for capturing carbon. Recently, Tesla owner and billionaire entrepreneur Elon Musk has thrown an open challenge to the Twitteriest and has announced a $100 million prize for the winner. To make his actions count in helping

control climate change on the planet Earth, and to develop a technology to capture carbon dioxide.

Since 2014 various aspects of carbon capture research have been carried out at Carbon Capture Lab, Department of Chemical Engineering. The research activities mainly focused on alternate energy efficient carbon-rich solvent regeneration technologies, Solvent development, process optimization of conventional Solvent-based Post-Combustion Carbon Capture (PCCC) and solvent regeneration. We express gratitude to Sri Sivasubramaniya Nadar College of Engineering to initiate and motivate the research activities on carbon capture. Over the years, various grants have been awarded to pursue our research activities by Government of India, Department of Science & Technology, TMD (Energy, Water & Others). The projects are focused on the developing energy efficient carbon rich solvent regeneration technology. As a result, it is a privilege and motivation for our team to carry out the Mission Innovation - Innovation Challenge (IC#3) CCUS Project on Bench-scale development to reduce the Carbon Capture energy demand.

Dr. B. Ambedkar
Associate Professor

APPLICATIONS OF IONIC LIQUIDS IN CLEAN ENERGY AND ENVIRONMENT

"Ionic Liquids" (ILs) are promising solvents for "green" separation operations and novel applications such as carbon capture, azeotropic separation and clean technology. The study reveals that ILs exhibits remarkable results in terms of reaction yield, product selectivity and ease of separation. These are of potentially significant environmental and commercial importance. Nevertheless, the wide range and variability in the properties of ILs are both challenges and opportunities for developing new and improved processes. Selecting the right ILs for a given task is depend on a many factor namely performance, availability and cost. The suitable selection of ILs is important to the overall success of any given separation process. Both fundamental and applied research are necessary to understand the properties of a ILs which would further helpful for their potential in replacing conventional solvents and operating in the "green" paradigm. Hence, the fundamental understanding of the characteristics and properties of ILs are of major interest for many researchers. This information will facilitate to design a new process using ILs with the expectation of improving on existing technology for clean energy and environment. Our research team is working towards achieving this goal set in mind and the work is in progress.

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