CURRICULUM VITAE

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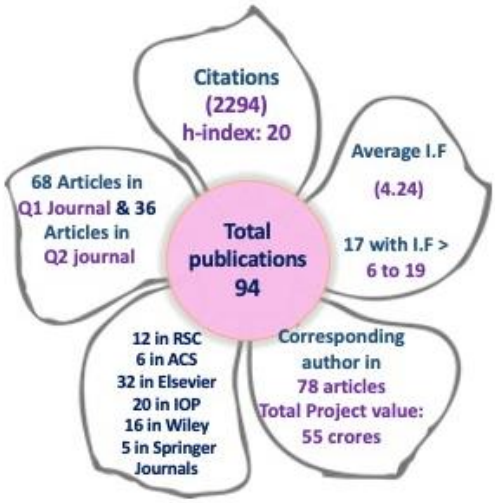

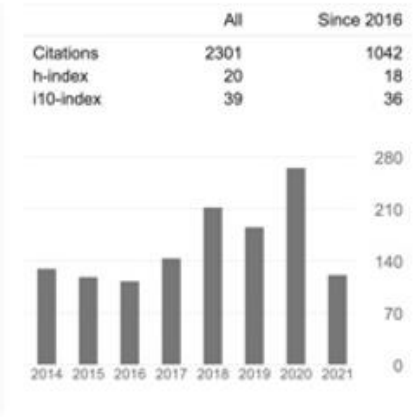

1. AWARDS, FELLOWSHIPS AND HONOURS

- Gust editor for the J. Electrochem. Soc., USA for the focus issue 'Energy Storage in China' in 2021
- Fellow of the Royal Society of Chemistry (FRSC)
- Fellow of the Academy of Sciences, Chennai
- Vice President of Indian Society for Electroanalytical Chemistry (ISEAC) for the period 2021-24, BARC, Mumbai.
- Visiting Professorship: Energy, Environment & Chemical Engineering Department, WASHINGTON UNIVERSITY @ St. Louis, Missouri (2019)
- Honorary scientific advisor for Twin Pole India Pvt. Ltd and Kapindra Precision Engineering Pvt. Ltd., Research Park, IIT Madras.
- Director nominated department representative for the Faculty Council of the Research Park of IIT Madras (since July 2019).
- Member of Board of Global Engagement, IIT Madras

- Department nominated member of Board of Placement for the year 2018-2019.
- Adjunct faculty at National Centre for Catalysis Research, IIT Madras, Chennai.
- Secured 94.4 percentile score in Graduate Aptitude Test in Engineering (GATE-2000)
- University Gold medallist: Bachelor of Science in Chemistry, Bharathiar University, Coimbatore, Tamil Nadu, India, April, 1998

2. EDUCATIONAL RECORD

Degree	Major / Specialization	Institute / University	Year of Passing	Marks (% / CGPA) / remarks
Ph.D.	The thesis titled "Studies on Direct Methanol and Direct Borohydride Fuel Cells" was supervised by Professor Ashok Kumar Shukla	Indian Institute of Science Bangalore	2006	First Class
P. G	M. Sc in Applied Chemistry	Anna University, Chennai	2000	88.8 % / 8.88 (CGPA)
U. G	B. Sc in Chemistry	Bharatiyar University (Sri Vasavi College)	1998	90 %/ University Gold Medallist

3. PROFESSIONAL RECORD

Degree	Department / Group Info	Institute / University	Year
Associate professor	Chemistry	Indian Institute of Technology Madras	2016-Present
Assistant professor	Chemistry	Indian Institute of Technology Madras	2012-2016
Post-Doctoral Research	Prof. Christina Bock and Prof. Barry MacDougall	National Research Council of Canada, Ottawa, Canada	March 2009- Feb 2011
	Prof. Scott Calabrese Barton	Michigan State University, East Lansing, MI, USA	Mar 2007 - Feb 2009

4. SUPERVISION OF GRADUATE STUDENTS

2011-2020 – PhDs: 7-completed +20-pursuing / MScs: 12-completed
2011-2020 – Postdoctoral fellows: 6- completed + 4 pursing

5. RESEARCH INTERESTS

Hydrogen storage by electrochemical reduction of nitrogen, Metal-ion batteries, Development of organic dyes and hole transporting materials for dye sensitized solar cells (DSSC) and perovskite solar cells, Electrode materials and novel redox couples for flow

battery, Electrode materials for oxygen reduction reaction in alkaline and acidic medium (Zn-air and polymer electrolyte membrane fuel cells), Development of high energy density supercapacitor materials and Development of sensors for biologically important molecules

6. PUBLICATIONS (~ Nearly 77 publications in the current position- Associate Professor)

Total number of publications: 94 since 2004

Book Chapters: 2

94. M. Debashis, P. K. Yashwant, R. Kothandaraman, H. Prathap and TijuThomas, S, N Co-Doped Graphene Quantum Dots Decorated TiO_2 and Supported with Carbon for Oxygen Reduction Reaction, *Inter. J. Hydrog. Energy*, 2021**,** Accepted, DOI: https://doi.org/10.1016/j.ijhydene.2021.04.013,

93. K. Ganapathi Rao, M. Sudip and R. Kothandaraman, Molecular engineering of near-infrared active boron dipyrromethene moiety with various donors and acceptors for tuning the absorption behavior and electron injection of the resultant dyes, *J. Photochem. Photobiol. A Chem,* 410, 113161, 2021, DOI: https://doi.org/10.1016/j.jphotochem.2021.113161

92. M. Raja, Harun Khan, S Sankarasubramanian, D Sonawat, V. K. Ramani and R. Kothandaraman, Binder-free thin graphite fiber mat sandwich electrode architectures for energy-efficient vanadium redox flow batteries, *Catal. Today*, 370, 181-188, 2021, DOI: https://doi.org/10.1016/j.cattod.2021.02.012,

91. Janraj Naik Ramavath, M. Raja, K. Balakumar and R. Kothandaraman, An Energy and Power Dense Aqueous Zinc-Ion Hybrid Supercapacitor with Low Leakage Current and Long Cycle Life, *J. Electrochem. Soc*., 168, 010538, 2021, DOI: https://doi.org/10.1149/1945-7111/abdc7a,

90. M. R. Chinmaya, M. Veerababu and R. Kothandaraman, Electrode and conductivity additive compatibility yielding excellent rate capability and long cycle life for substanable organic aqueous Zn-ion batteries, *ACS Applied Energy Materials*, 4, 1218-, 2021, DOI: https://doi.org/10.1021/acsaem.0c02511

89. L.K. Nivedha, M. Raja, R. Kothandaraman, Interplay of the functional units of a binder in the oxygen reduction process of zinc-air battery, *Catal. Today*, 370, 66-74, 2021, DOI: https://doi.org/10.1016/j.cattod.2020.09.022

88. M. R. Chinmaya and M. Veerababu and R. Kothandaraman, Crossover-free hydroxy-substituted quinone anolyte and potassium ferrocyanide catholyte for aqueous alkaline organic

redox flow battery, *Catal. Today*, 370, 173- 180, 2021**,** **DOI:** https://doi.org/10.1016/j.cattod.2020.12.012,

87. M.Vivekananda, M. Raja, Harun Khan and Kothandaraman R, Drastic Improvement in Capacity-Retention and Polarization of Vanadium Redox Flow Battery with Hydrophilic Co_3O_4 Nanostructure Modified Activated Graphite Felt Electrodes, *J. Electrochem. Soc.*, 167, 160504, 2020, DOI: https://doi.org/10.1149/1945-7111/abc90a,

86. M. R. Chinmaya, M. Raja, Vasudevarao P, Kothandaraman R and Sankararaman S, Functionalised carbazole as a cathode for high voltage non-aqueous organic redox flow batteries, *New J. Chem*., 44, 14401-14410, 2020, DOI: https://doi.org/10.1039/D0NJ02543G,

85. Kharwar, Yashwant Pratap, Srinu Akula, Akhila Kumar Sahu, and Kothandaraman R, Highly Durable Pt-Based Catalyst Supported on Carbon Derived from Tamarind Seeds for Oxygen Reduction Reaction in PEM Fuel Cell, *J. Electrochem. Soc.*, 167, 104515, 2020, **DOI:** https://doi.org/10.1149/1945-7111/ab9c7c,

84. D. Unny, G.R. Kandregula, J. Sivanadanam, K. Ramanujam, Molecular engineering of pyrene carbazole dyes with a single bond and double bond as the mode of linkage, *New J. Chem*., 44, 16511-16525, 2020, DOI: https://doi.org/10.1039/D0NJ03228J,

83. Tamilselvi G, Raja M,, Akalya.D,, Kothandaraman.R, , Confinement Catalysis of Non-covalently Functionalized Carbon Nanotube in Ascorbic Acid Sensing, E*lectroanalysis*, 32, 1-13, 2020, **DOI:** https://doi.org/10.1002/elan.202060119**,**

82. A. Rajput, H. Khan, S.K. Raj, R. Kothandaraman and V. Kulshrestha, Styrene- co -DVB grafted PVDF proton exchange membranes for vanadium redox flow battery applications, *Mater. Adv*., 1, 1930, 2020, DOI: 10.1039/D0MA00496K,

81. S. Mandal, G.R. Kandregula, R. Kothandaraman, , Replacing aromatic π-system with cycloalkyl in triphenylamine dyes to impact intramolecular charge transfer in dyes pertaining to dye-sensitized solar cells application, *J. Photochem. Photobiol. A Chem*., 403, 112862, 2020, DOI: https://doi.org/10.1016/j.jphotochem.2020.112862,

80. P. Mani, A. Sheelam, P.E. Karthik, R. Sankar, R. Kothandaraman, S. Mandal, Nickel-Based Hybrid Material for Electrochemical Oxygen Redox Reactions in an Alkaline Medium, *ACS Appl. Energy Mater.*, 3, 6415, 2020, DOI: https://doi.org/10.1021/acsaem.0c00615,

79. U. Naveen Kumar, Janraj Naik Ramavath, Sourav Ghosh, Tiju Thomas and R. Kothandaraman, Chromium oxynitride as durable electrode materials for symmetric

supercapacitors, *Batteries & Supercaps*, 3, 780-788, 2020, DOI: https://doi.org/10.1002/batt.201900225,

78. J. Vanshika, G. Tamilselvi, P. Gayathri and R. Kothandaraman, Oxygen sensitive 1-amino-2-naphthol immobilized functionalized-carbon nanotube electrode**,** *New J. Chemistry*, 44, 8849-8858, 2020, DOI: https://doi.org/10.1039/D0NJ00438C,

77. Ganapathi Rao Kandregula, S. Jagadeeswari and R. Kothandaraman, Drastic improvement in dye-sensitized solar cell efficiency by electrosorption based dye staining of titania semiconductor photoanode, *Electrochimica Acta*, 349, 136344, 2020, DOI: https://doi.org/10.1016/j.electacta.2020.136344,

76. S. Jagadeeswari, Indrapal Singh Aidhen and R. Kothandaraman, New cyclic and acyclic imidazole-based sensitizers for achieving highly efficient photoanodes for dye-sensitized solar cells by potential assisted method, *New J. of Chemistry*, 44, 10207-10219, 2020, DOI: https://doi.org/10.1039/D0NJ00137F,

75. Srinivasan, Venkatesan, Jagadeeswari Sivanadanam, R. Kothandaraman, and Mariadoss Asha Jhonsi, Selineating the enhanced efficiency of carbon nanomaterials including the hierarchical architecture of the photoanode of dye-sensitized solar cells, *Mater. Adv.*, 1, 2964-2970, 2020, DOI: 10.1039/D0MA00654H,

74. Niedzwiedzki, DM and Kandregula, GR and Sivanadanam, J and R. Kothandaraman, Excited State Properties of Metal-Free (D2d and T-SB-C) and Ru-Based (N719 and Z907) Dyes and Photoinduced Charge Transfer Processes in FTO/$TiCl_4$/TiO_2/Dye Photoanodes Fabricated by Conventional Staining and Potential-Assisted Adsorption, *J. Phys. Chem. A*, 124, 22, 4333-4344, 2020, DOI: https://doi.org/10.1021/acs.jpca.0c00653

73. Ganapathi Rao Kandregula, Sudip Mandal, Prince Gollapalli, Satyesh Yadav, and R. Kothandaraman, A computational study on boron dipyromethene ancillary acceptor-based dyes for dye-sensitized solar cells, *New J. Chem.*, 44, 4877-4886, 2020, DOI: https://doi.org/10.1039/C9NJ05334D,

72. J. Prerna, R. Vedarajan, S. Anjaiah, R. Kothandaraman, Bernard Malaman, and NoriyoshiMatsumi, An all solid-state Li ion battery composed of low molecular weight crystalline electrolyte, *RSC Advances* 10, 8780-8789. 2019, DOI: 10.1039/C9RA09559D,

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Efficient Oxygen Reduction Reaction, *Chem. An Asian J.*, 14, 4814-4818, 2019, DOI: https://doi.org/10.1002/asia.201901242,

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63. M. Veerababu, R. Kothandaraman, Glycination: A Simple Strategy to Enhance the Cycling Performance of Perylene Dianhydride for Secondary Li-Ion Battery Applications, *ChemistrySelect*, *3*(38), 10657-10662, 2018, DOI: https://doi.org/10.1002/slct.201801588,

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55. M. Sudip, R. Vedarajan, Matsumi, N., and R. Kothandaraman, Computational Investigation of the Influence of π-Bridge Conjugation Order of Thiophene and Thiazole Units in Triphenylamine Based Dyes in Dye-Sensitized Solar Cells, *ChemistrySelect*, *3*(13), 3582-3590, 2018, DOI: https://doi.org/10.1002/slct.201702882,

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53. S. Jagadeswari, R. Mukkamala, M. Sudip, , S. R Vedarajan,., N. Matsumi, I. S. Aidhen, and R. Kothandaraman, Exploring the role of the spacers and acceptors on the triphenylamine-based dyes for dye-sensitized solar cells, *Inter. J. Hydro. Energy*, *43*(9), 4691-4705, 2018, DOI: https://doi.org/10.1016/j.ijhydene.2017.10.183,

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49. P. Gayathri and R. Kothandaraman, Redox Active Cobalt-Bipyridine Metal Organic Framework-Nafion Coated Carbon Nanotubes for Sensing Ascorbic Acid, *J. Electrochem. Soc.*, *165*(13), B603-B609, 2018, DOI: https://doi.org/10.1149/2.0661813jes,

48. U. Dhivya, S. Jagadeswari, , M. Sudip, I. S. Aidhen, , and R. Kothandaraman, Effect of Flexible, Rigid Planar and Non-Planar Donors on the Performance of Dye-Sensitized Solar Cells, *J. Electrochem. Soc 165*(13), H845-H860, 2018, DOI: https://doi.org/10.1149/2.0551813jes,

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2. A. K. Shukla, and R. Kothandaraman, Methanol-resistant oxygen-reduction catalysts for direct methanol fuel cells, *Annu. Rev. Mater. Res.*, 33, 155-168, 2003, DOI: https://doi.org/10.1146/annurev.matsci.33.072302.09351,

1. A. K. Shukla, C. L. Jackson, K. Scott, and R. Kothandaraman, An improved-performance liquid-feed solid-polymer-electrolyte direct methanol fuel cell operating at near-ambient

conditions, *Electrochimica acta*, 47, 3401-3407, 2002, DOI: https://doi.org/10.1016/S0013-4686(02)00276-1,

7. LIST OF SPONSORED /CONSULTANCY PROJECTS along with Values

IITM – 5 (2.47 Cr); DST – 7 (~ 46 Cr); CSIR – 1 (3 L) Consultancy-3 (~ 3.36 Cr.), CSR-1 (~ 21L)

8. PATENTS:

Patents granted

1. Novel catalyst for oxygen reduction reaction in fuel cells, SAC Barton, R. Kothandaraman, V. Nallathambi (U.S. Patent, Year: 2016, # 9,379,388).
2. A method of preparing novel catalysts for oxygen/air reduction of fuel cells and metal-air batteries Kothandaraman, R. and Karthikayini M P (Indian Patent, Year: 2019, Patent No. 324235).

PATENTS APPLIED

1. A new 'multilayer sandwich design' of a Redox Flow Battery Cell, Kothandaraman R. and Varadaraju U V (Indian Patent, Year: 2013, App. No.: 3713/CHE/201).
2. Organic materials capable of suppressing H_2 evolution and oxidizable by V^{5+} (VO_2^+) for redox balancing in vanadium redox flow battery. Kothandaraman R and Vasudevarao P (Indian Patent, Year:2016, App. No. 201641030008).
3. Solvent Filled Multiwalled Carbon Nanotubes for Enhanced Electrochemical Sensing Applications. Kothandaraman R, and Tamilselvi G. (Indian Patent, Year: 2018, App. No. 201841042599).
4. Molecular and Electrode Engineering of Pentacene-5,7,12,14-tetraone for sustainable organic Aqueous Zn-ion batteries. Kothandaraman R, Veerababu M, Chinamay R. (Indian Patent, Year: 2019, IDF NO. 1945)
5. Organic catholyte materials for aqueous organic flow battery. Kothandaraman R, Indrapal Singh Aidhen, Raja M and Jagadeeswari S (Indian Patent, Year: 2020, App. No. 202141000317)

9. WHEREABOUTS OF PHD STUDENTS:

S. No	Name of the scholar	Title of the thesis	Current affiliation	Year of award
1	Dr. M. P Karthikayini	Metal-nitrogen-carbon (MNC) based non-precious metal catalysts for electrochemical reduction of oxygen in fuel cells	Chemist (Group B Gazetted Officer), Department of Industries and Commerce, Government of Tamilnadu, Guindy, Chennai	2016

2	Dr. Anjaiah Sheelam	Metal-organic complexes and carbon materials derived from metal-organic complexes for oxygen reduction reaction in alkaline medium	Postdoctoral fellow, Center for Condensed Matter Sciences, Department of Physics, National Taiwan University, Taiwan	2017
3	Dr. T. Thirupathi	Cobalt and nitrogen doped carbon materials for rechargeable zinc-air battery and carbon supported g-C_3N_4 for hydrazine sensor applications	Manager, Renewable energy systems limited, Hyderabad	2017
4	Dr. M. Veerababu (Co-guided)	Studies on certain aromatic diimides and conjugated carboxylates as electrode materials for secondary lithium/sodium-ion battery applications	Scientist of Energy Technology, Godi India Pvt. Ltd, Hyderabad	2017
5	Dr. Rakesh Verma (Co-guided)	Ternary Transition Metal Oxides and Sulphides as New Anode Materials for Rechargeable Alkali Metal Ion (Lithium and Sodium) Battery Applications	Postdoctoral Research, Materials Electrochemistry Lab, Department of Materials Science and Engineering, Chonnam National University, 77 Yongbongro Bukgu, Gwangju 61186, South Korea.	2017
6	Dr. P Vasudevarao	Studies on new electroactive fluids and catalysts for redox flow batteries and membrane less fuel cells	Deputy Manager, R&D Li-ion Battery Technology, Amara Raja Batteries Limited, Karakambadi, Tirupati, Andhra Pradesh – 517520	2018

7	Dr. Sudip Mandal	Molecular Engineering for Dye-Sensitized Solar Cells and Chemosensors: An Experimental and Computational Approach	Assistant Professor, Division of Chemistry, Department of Sciences and Humanities, Vignan's Foundation for Science, Technology and Research (Deemed to be University), Guntur, Andhra Pradesh	2019

Research Guidance (PhD) under progress:

S. No.	**Roll No./Name**	**Tentative title/ Area of research**	**Status**	**Expected Year of Completion**
1.	CY16D043/ M. R. Chinmaya	Tweaking redid-active organic material properties and electrode engineering for rechargeable battery applications	2nd Seminar Completed	2021
2.	CY16D035/ Divya Unny	Experimental and computational studies of arylamine based organic dyes for DSSC applications	2nd Seminar Completed	2021
3.	CY16D083/ Ramavath Janraj Naik	Boosting the energy density of aqueous supercapacitor through the multitude of approaches and development of eco-benign membrane/binder materials	2nd Seminar Completed	2021
4	CY15D112/ Yashwant Pratap Kharwar	Fuel cells	2nd Seminar Completed	2021

6	PH16D30/ Dipsikha Ganguly *	Fuel cell and Li-S batteries	5th Year	2021
7	CY17D055/ Tamil Selvi G.	Biomolecules and small molecules detection/activation: (A) Conventional and unconventional modifications to multiwalled carbon nanotubes for biomolecules, oxygen and peroxide detection (B) hydrogen storage by electrochemical reduction of nitrogen	2nd Seminar	2021
8	CY17D038/ Kandregula Ganapathi Rao	Dye sensitized solar cell and related computational work	4th Year	2022
9	CY17D037/ Vivekananda Mahanta	Vanadium and Organic redox flow batteries	4th Year	2022
10	CY18D104/ Richa Gupta	Zn-ion batteries	3rd year	2023
11	CY18D026/ Nivedha, L. K.	Zinc-Air batteries	3rd year	2023
12	CY18D088/ Harun Khan	Vanadium and Organic redox flow batteries	3rd year	2023
13	Potham Sravani/ CY18D131	Supercapacitors	3rd year	2023
14	CY20D045/ Mohana Priya	Li-S batteries	1st Year	2025
15	CY20D049/Swathi Panigrahi	Li-S batteries and electrochemical reduction of nitrogen	1st Year	2025

PhD Students Internship Details (Japan Student Service Organization (JASSO) Fellowship)

S. No.	Name of the student	Institute	Year	Research Advisor
1.	Dr. S. Anjaiah	Japan Advanced Institute of Science and Technology, Ishikawa Prefecture, Nomi, Japan	2015	Prof. Noriyoshi Matsumi
2.	Dr. M. Sudip	Japan Advanced Institute of Science and Technology, Ishikawa Prefecture, Nomi, Japan	2016	Prof. Noriyoshi Matsumi
3.	Dr. P Vasudeva Rao	Linnaeus University-Sweden	2017	Prof. Ian Nicholls's
4.	Mis. Sumana Brahma	Japan Advanced Institute of Science and Technology, Ishikawa Prefecture, Nomi, Japan	2018	Prof. Noriyoshi Matsumi
5	Ms. Tamilselvi (Selected by DST-Inspire to take part in the HOPE Meeting – Japan for her outstanding contribution in sensors research)		2020	Meeting cancelled due to COVID

NPDF projects hosted / other grant details

S.No	**Title of the Project**	**Amount (Rs. In lakhs)**	**Scholar Name**	**Start date**	**Duration**
1.	INSA visiting scientist programme		Dr. L Kungumadevi		2020 (Approved)
2.	Light induced process of Hierarchical electron cascade system, Materials and Devices for Solar energy conversion (Teachers Associateship For Research Excellence- TARE)	10.05	Dr. M. Asha Jhonsi	14-11-2018	3 Years (ongoing)

3.	ICS/18-19/832/RFIE/MAHS Iron-Dicyano Dichloro Quinone Primary/Reserve Battery	2.0	ICSR-IITM Innovative Project		2 Years (completed)
4.	CHY1718376DSTXKOTH Enhance photovoltaic performances of dye-sensitized solar cells sensitized with triphenylamine/phenothiazine-oxindole/dithienobenzotrizole based dyes	17.02	Dr. Selvam (NPDF)	21-06-2017	2 Years (completed)
5.	CHY1718389DSTXKOTH Permselective membrane and polymer/garnet electrolyte for Li-S batteries	19.2	Dr. M. Raja (NPDF)	21-09-2017	2 Years (completed)
6.	CHY1718394DSTXKOTH Novel porous 3D architectures of Nanocarbons for the Photo and Electrochemical Production of Green fuels from CO_2 and H_2O: A Better solution for the two global problems	19.2	Dr Chiranjeevi Srinivasarao Vusa	25-10-2017	2 Years (completed)
7.	CHY1617355DSTXKOTH Electroorganic Modifications of Graphene into Redox-mediator-cum-Substrate to Immobilize Glucose Oxidase/Cholestrol Oxidase for Bio-sensor Applications	19.2	Dr. P. Gayathri	08-06-2016	2016 2 Years (completed)

10. THESIS REVIEWED/ VIVA-VOCE CONDUCTED

1.	Novel Approaches and Design Principles for Interfacial Engineering of Double-Layer Based Flexible Energy Storage Devices" of Mr. Mihir Kumar Jha, Indian Institute of Technology Bombay, 2021
2.	Carbonic and non-carbonic filler reinforced polymeric composites as electrode materials for supercapacitor application, Bela Purty, Indian Institute of Technology (Indian School of Mines) Dhanbad, 2021

3.	Development of phosphors for solar cell and LED applications, Akta Verma, Indian Institute of Technology (Indian School of Mines) Dhanbad, 2020
4.	Binary metal oxide nanostructures for energy conversion and storage application Gyan prakash sharma, Indian Institute of Technology Kanpur, 2019
5.	Studies on metal-free electrocatalysts for oxygen reduction reaction in polymer electrolyte membrane fuel cells, Srinu Akula, Academy of Scientific and Innovative Research (AcSIR), CSIR-Central Electrochemical Research Institute, Taramani, Chennai, 2019
6.	Microbial fuel cells for energy and environmental applications, M. Sindhuja, SRM Institute of Science and Technology, Chennai, 2019
7.	Nanoarchitectured materials for electrochemical applications
	S. Arulmani, *National Institute of Technology* -Trichy, 2019
8.	Development of nano/ultrafine structured silicon ball milling and spark plasma
	R Murugasami, *National Institute of Technology* -Trichy, 2018
9.	Heteroatom doped reduced graphene oxide for electrochemical supercapacitor application
	S. Suresh Balaji, AcSIR (Academy of Scientific & Innovative Research) CSIR-CECRI (Council of Scientific & Industrial Research -Central Electrochemical Research Institute), Karaikudi 2019
10.	Eco-benign electrodes and binders for energy storage applications
	K.R. Saravanan, AcSIR (Academy Of Scientific & Innovative Research) CSIR-CECRI (Council of Scientific & Industrial Research -Central Electrochemical Research Institute), Karaikudi 2018
11.	Studies on electrode material for lithium-sulfur batteries and supercapacitors,
	R. Aswathy, AcSIR (Academy of Scientific & Innovative Research), CSIR-CECRI (Council of Scientific & Industrial Research -Central Electrochemical Research Institute), Karaikudi 2018
12.	Efficient light harvesting using hybrid plasmonic nanoparticles for energy application
	Dhavalkuma N. Joshi, Pondicherry University, Pondichery, 2018
13.	Investigation of polymer materials containing pendant-chromophore for improving the efficiency of dye sensitized solar cells,
	R. Selvam, Anna University, Chennai, 2018
14.	Kinetics and mechanism of oxidation of aniline and its substituents catalysed by iron (III) phthalocyanine chloride
	P. Tamilselvi, Anna University, Chennai, 2017

11. INVITED LECTURES (WORKSHOP/CONFERENCE/SYMPOSIUM/SEMINAR)

1.	Title: Sustainable Materials for Energy Storage Seminar Venue: National Centre for Nanoscience and Nanotechnology, University of Madras, Chennai, 16th March 2020 (this seminar is organized by the Director of National Centre for Nanoscience and Nanotechnology, University of Madras for the post graduate students)

2.	Title: Catalysis on the surface of nanotubes having confined solvent media Conference details: Asian Consortium for Computational Materials Science: International Conference on Materials Genome (ICMG-2020), SRM University, Amaravathi, 5-7th February 2020.
3.	Title: Solvent Filled Multiwalled Carbon Nanotubes for Sensor and Battery Applications Conference details: Electrochemistry in Industry Health and Environment, BARC, Mumbai, 21-25th January 2020 (organized by Indian Society for ElectroAnalytical Chemistry)
4.	Title: Ultra high energy efficient redox flow battery, Conference details: Frontiers in Materials Processing Applications, Research and Technology (FiMPART, Endorsed by Materials Research Society Singapore), Convention Centre, Ahmedabad, 15-17th December 2019.
5.	Title: Low Field ^{1}H NMR Investigations of Solvent Filled Multiwalled Carbon Nanotubes for Sensor and Battery Applications Symposium details: Solid State and Structural Chemistry Unit, Alumni Symposium 2019, Indian Institute of Science, Bangalore, 13th December 2019.
6.	Title: Beyond Vanadium Redox Flow Battery: India Specific Solutions for Energy Storage Invited lecture details: Chemical Engineering seminar, Indian Institute of Technology Kanpur, 06th November 2019
7.	Title: Tuning overpotential and electrolyte structure to realize high energy efficient redox flow battery Conference details: International Conference on Recent Trends in Chemistry of Materials (NCRTCM-2019), Bannari Amman Institute of Technology, Sathyamangalam, 12th October 2019
8.	Title: Materials for Electrochemical Applications Faculty development program details: STC on 2D Materials, ICSR Hall 3, Indian Institute of Technology Madras, Chennai, 23rd September 2019
9.	Title: Tuning overpotential and electrolyte structure to realize high energy efficient redox flow battery Conference details: Recent Advances in Materials Science for Sustainable Development-2019 (RAMSSD-2019), VFSTR (Deemed to University), 1st September 2019
10.	Title: Enhanced Electrochemical Sensing of Endohedral Carbon Nanotubes, Symposium details: Chemistry in-House Symposium (CiHs), Indian Institute of Technology Madras, Chennai, 21st August 2019
11.	Title: A New Process for Quick Fabrication of Dye Sensitized Solar Cells Invited lecture details: SSN College, Kalavakkam, Chennai, 16th March 2019
12.	Title: Strategic Partnership with IIT Madras and Joint Workshop Indian Institute of Technology Madras, Chennai 11-13th July, 2018
13.	Title: Modification of Graphite Felt Electrodes for Vanadium Redox Flow Battery Application

	Workshop details: Indo-German Joint Scientific Workshop on Membranes for Water and Energy, CSIR- Central Salt and Marine Chemicals Research Institute (CSMCRI), 18th -20th February 2019
14.	Title: Recent Developments in Redox Flow Battery Chemistry Conference details: Advanced Nanomaterials for Energy, Environment and Healthcare Applications (ANEH – 2019), Bishop Heber College, Trichy, 05th February 2019
15.	Title: Stable Radical Ion Based Redox Flow Battery Seminar details: ChEMS Seminar, Chemical Engineering and Materials Science, Michigan State University, 15-16th October 2018
16.	Title: Metal-air batteries Seminar details: HP Green R&D Centre, Bangalore, 9th March 2018
17.	Title: Our Recent Experience with Redox Flow Batteries Invited lecture details: CSIR-CECRI (Council of Scientific & Industrial Research - Central Electrochemical Research Institute), Karaikudi, 20th September 2018
18.	Title: Organic Materials for Energy Science: DFT Guided Molecular Engineering Approach Materials Design and Energy Materials: Computational Approach Seminar details: SRM Institute of Science and Technology, Chennai, 5th February 2018
19.	Title: Synthetic and Bio-derived Nanostructures for Selective Sensing of Biotinyl Targets Symposium details: Symposium on Materials in Chemistry & Biology, Indian Institute of Technology Gandhinagar, Gujarat, 5th January 2018.
20.	Title: Metal Organic Framework and Organic Framework Built on Carbon Nanotubes by π-π Interaction for Electrochemical Applications Conference details: CEAMCR-2018, DAE Convention Centre, Anushaktinagar, Mumbai - 15-17th February-2018
21.	Title: A Strategy of Enhancing the Surface Plasmon Assisted Light Harvesting in Dye Sensitized Solar Cells Conference details, National Convention of Electrochemist (NCE-19), National Institute of Technology –Trichy, 28 - 29th March 2016
22.	Title: Non-precious metal catalysts for fuel cell application Conference details: INDO-US ECM-2013, Banaras Hindu University, Varanasi, 26 - 28th February, 2013
23.	Title: Non-precious metal catalyst developed by freeze dry method Conference details: Recent Advances in Electrochemical Energy Materials and Devices, Indian Institute of Science (IISc) Bangalore 24-25th July-2012

12. WORK PRESENTED IN INTERNATIONAL CONFERENCES (2011-2020)

1. G. Tamilselvi, and R. Kothandaraman, "1-Amino 2-Naphthol Modified Solvent Filled Carbon Nanotubes for Enhanced Electrochemical Sensing of Bioanalytes" 237th ECS Meeting with the 18th International Meeting on Chemical Sensors (IMCS 2020) (May 10-14, 2020). The Electrochemical Society, **2020.**
2. Ramaprabhu, Sundara, R. Kothandaraman and Dipsikha Ganguly, "Low Pt Loaded Nitrogen Doped Carbon as Efficient Catalyst Support for Proton Exchange Membrane Fuel Cells" 236th ECS Meeting October 13, 2019 - October 17, 2019 Atlanta, GA, Meeting Issue No. 35, Page. No. 1571, The Electrochemical Society, **2019.**
3. Yashwant Pratap. K, Akula, S., Sahu, and R. Kothandaranam, "Synthesis of Pt/C Catalyst Using Carbon Support Derived from Tamarind Seeds through Hetroatom Doping for Oxygen Reduction Reaction" 235th ECS Meeting May 26, 2019 - May 30, 2019 Dallas, TX, Meeting Issue. No. 33, Page No. 1747, The Electrochemical Society, **2019**.
4. R. Kothandaraman and Anjaiah Sheelam "A Simple and Inexpensive Organometallic Compound Catalyzing Oxygen Reduction Reaction" 230th ECS Meeting October 2, 2016 - October 7, 2016 Honolulu, HI, Meeting Abstract No. 2822, Issue No. 38, The Electrochemical Society, **2016.**
5. Veerababu, Medabalmi, U. V. Varadaraju, and R. Kothandaraman "Lithium Biphenyl-3, 3', 4, 4'-Tetracarboxylate Based Anode Material for Li and Na-Ion Battery Application" 229th ECS Meeting May 29, 2016 - June 2, 2016 San Diego, CA, Meeting Abstract No. 505, Issue No. 5, The Electrochemical Society, **2016.**
6. Sheelam, Anjaiah, and R. Kothandaraman "Effect of oxidation states of vanadium in VNC based non-precious metal catalyst for fuel cells in acidic medium" 224th ECS Meeting October 27, 2013 - November 1, 2013 San Francisco, CA, Meeting Abstract No. 306, Issue No. 5, The Electrochemical Society, **2013.**
7. R. Kothandaraman, and M. P. Karthikayini "Mn Based NPM Catalyst for Oxygen Reduction Reaction in Acidic Medium for Pemfcs" 224th ECS Meeting October 27, 2013 - November 1, 2013 San Francisco, CA, Meeting Abstract No. 308, Issue No. 5, The Electrochemical Society, **2013.**

8. R. Kothandaraman "A Novel Approach for Effective ORR NPM Catalysts Development" 221st ECS Meeting May 6 - May 10, 2012 Seattle, Washington, Meeting Abstract No. 291, Issue No. 6, The Electrochemical Society, **2012.**
9. R. Kothandaraman "Improving Oxygen Reduction Activity of the Iron-Nitrogen-Carbon Catalysts by Formation of Fruitful Active Sites" 220th ECS Meeting October 9 - October 14, 2011 Boston, MA, Meeting Abstract No. 322, Issue No. 7, The Electrochemical Society, **2011**

13. SERVED AS REVIEWER FOR TOP JOURNALS LIKE

(i) Nature Communications

(ii) J. Materials Chemistry A

(iii) Electrochimica Acta

(iv) ACS Applied Materials & Interfaces

(v) J. Electrochemical Society

Scientific Career profile and Background

Dr Kothandaraman has focused his expertise in electrochemistry on contributing to realize India-centric solutions for the ever-growing need of energy storage and conversion. Therefore, his motivation is in the direction of developing new functional materials, redox-active organic molecules, and utilization of abundant resources such as sodium and zinc towards developing newer energy systems. His academic research pursuits under the broad headings of (i) Lithium/Sodium/Zinc/Vanadium based batteries; (ii) Organic Dyes for Solar Cells; (iii) hydrogen storage via electrochemical reduction of nitrogen and (iv) Sensors have enabled delivery of "*translatable research*". He is one of the founder and scientific advisor for TWIN POLE INDIA PVT LTD, a company dealing with niche electrochemical applications and he is scientific advisor for "Kapindra Precision Engineering Solutions Pvt. Ltd" in the research park of IIT Madras.

Under the heading of Li/Na batteries and in a bid to find a suitable anode material for sodium-ion battery (NIBs), His initial innovation with naphthalene-2-6-dicarboxylate (NDC) (*JES*, **2018**, 165, A175) provided sustainable and cost-effective alternative, and additional insights for overcoming the challenges posed by other materials explored for the same objective, such as biphenyl tetracarboxylate and perylene-3,4,9,10-tetracarboxylate. NDC demonstrated biphasic sodiation/desodiation behavior with negligible volume change. The use of lithium salt of diimide dicarboxylate solved the solubility issues of cathode (mitigating capacity loss) and led to the development of Li/Na salts of N,N'-bis(glycinyl)X (X= perylene diimide, pyromellitic diimide, naphthalene diimide, perylene diimide). Further fine tuning of the conductivity issue associated with these organic scaffolds, by reducing bandgap energy through chromophores and π-conjugation led to the development of lithium 1,1'-biphenyl]-4,4'-dicarboxylate as a new material, with a stable capacity of 165 mAh g^{-1} [*JES*, **2017**, *164*, A1720].

The fact that Zinc-ion batteries (ZIB) are much safer compared to LIB and NIBs, as it functions with aqueous electrolyte, inspired Dr Kothandaraman to delve deeper. To enhance the poor diffusion of Zn^{2+} from the commonly used intercalated lattice of α-MnO_2 and vanadium oxides in the ZIB, due to a strong Zn^{2+}-oxide ion coulombic interactions, Dr Kothandaraman innovated on reducing the coordination number of the Zn^{2+} ion or increasing the gap between the layers of the

host material. The use of highly conjugated pentacenetetraone and electronegative S containing dibenzo[b,i]thiantrene-5,7,12,14-tetraone has paved the way. Capacity as high as 200 mAh g^{-1} has been achieved for 2000 cycles at 80 mA g^{-1} The innovation has been patented (*Indian Patent*, **2019**, IDF NO. 1945).

In collaborative mode and under the topic of dye-sensitized solar cells (DSSCs), experimentation with organic scaffolds containing triphenylamine units, carbazole and pyrene-phenothiazine heterocyclic units and less known imidazole based donor moieties has enabled the discovery of new phenothiazine based dye, showing 12% power conversion efficiency (PCE) [*J. Materials Chem. A* **2017**, *5*, 10289, one of the best performing dyes in literature]. Among the imidazole based dyes, PCE of 8.1 % has been achieved and this is the best among imidazole based dyes [*New J. Chemistry* DOI: 10.1039/d0nj00137f]. This article will appear soon with a cover-page art of this work in its 25th issue. The photophysical and electronic properties of the redox active organic functional materials developed by molecular engineering for NIBs, ZIBs and DSSC were explained at molecular level using the DFT calculations.

Realizing the importance of sensing physiologically important endogenous molecules, he experimented with sensing of peroxide, dopamine, uric acid, and ascorbic acid using immobilized metal-organic framework and solvent-filled multiwalled carbon nanotubes (MWCNTs) achieving the objective of sensing [*JES* **2019**, *166*, B1186]. The novel approach of organic solvent filling of MWCNTs (confirmed by ^{1}H NMR T1 relaxometry) improved the detection limit by an order of magnitude. His work on copper-benzotriazole modified MWCNTs for oxygen reduction reaction(ORR) was published with cover feature (*ChemElectroChem* **2018**, *5*, 1740).

With the funding from Institute of Eminence (IoE)-IIT Madras, he has established a potential centre for excellence (pCoE) on Advanced Energy Storage and Conversion. This centre comprises two more faculty from the department of chemistry and one from Dept. Physics and its activity is focused on Li-S batteries and Perovskite solar cells.

He is PI of the photovoltaic vertical of the DST-IITM Solar Energy Harnessing Centre, a 40 Cr. facility instituted at IIT Madras. He has developed a state of the art photovoltaic laboratory for developing organic solar cells.

Industry/technology Oriented Contributions: His contributions in fuel cell domain relying on non-platinum catalyst for ORR have fetched two patents, (U.S Patent: (2016) 9379388 and Indian Patent: (2019) 324235). An electrosorption based quick dye staining of TiO_2 photoanode has been developed, which readies photoanode of any dye in an hour, as opposed to 12 to 24 h required in the conventional staining process (*Electrochimica Acta* DoI: 10.1016 /j.electacta.2020.136344). Two Indian patents have been filed on vanadium redox flow battery (VRFB) (App. No. 3713/CHE/201 (2013) and 201641030008 (2016)), and a 300 W/1kWh VRFB system was built and demonstrated to DST-SERI in the last review meeting held in October 2019. He was awarded a consultancy project to the tune of 3.3 crores from ONGC, in Dec 2019, to build 10kW/10kWh VRFB capable of operating at current density > 100 mA cm^{-2} at 1.2 V per cell. A CSR funding of ~ 21 lakhs was awarded, to extract micronutrients like zinc from the spent batteries, by Tide Water Oil Co. Ltd. Other contributions include the development of oxygen sensor for Elixir Electronics and electrochemical H_2O_2 production unit for Research Supporters Initiative. In the case of aqueous organic redox flow battery, energy density of quinone type redox couples was improved incorporating multiple alkyl amine handles targeting solubility of the compounds. His products were showcased in the past in two events: (i) New Generation Ideation Contest-2019 organized by HPCL and (ii) KPIT Sparkle 2019 organized by KPIT technologies (his VRFB stack was one of the 30 exhibits showcased in the KPIT grand finale held at Mumbai on 15th February 2019).

The scientific contributions of Dr Kothandaraman find their place in some of the top-notch core electrochemical journals such as *J. Electrochem. Soc.* (*JES*), *Electrochimica Acta*, etc. (75 publications to date), and were presented at many national and international conferences. On invitation from DST, he has served in the panel of expert member in the quarterly review meeting of MES on 22nd November 2018 held at IISc-Bangalore.