

## CURRICULUM VITAE

### **R.BALAJI**

Scientist

Centre for Fuel Cell Technology (CFCT)  
International Advanced Research Centre  
for Powder Metallurgy and New Materials (ARCI)  
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6, Kanagam Road,  
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### **EDUCATION QUALIFICATION**

**April '2002-July' 2006**

PhD  
CSIR-CECRI, Karaikudi, India

**Nov'1998- Nov'2000**

Post Graduate in Chemistry  
Dept of Chemistry, Alagappa University  
Karaikudi

**June'1994 – May'1997**

Under Graduate in Chemistry  
Madurai Kamaraj University, Madurai

### **PROFESSIONAL EXPERIENCE**

**Dec'10 - Till Date**

**Scientist**  
Centre for Fuel Cell Technology  
ARCI, Chennai.

**Sep'2009-Nov' 2010**

**Post Doctoral Fellow**  
Kitami Institute of Technology, Japan,  
ARCI, Chennai

**Aug'2008-August' 2009**

**Research Associate**  
CSIR-CECRI, Karaikudi

**Aug'2006-Sep' 2008**

**Scientist,**  
Centre for Energy Research  
SPIC Science Foundation, Chennai

**Aug'1998- July' 2006**

**Project Associate,**  
CSIR-CECRI, Karaikudi, India

## FIELD OF RESEARCH INTEREST

Hydrogen energy technologies Electrochemistry, Electrochemical process, Electrocatalysts, Electroplating, corrosion, water/waste water treatment

## PROJECTS HANDLING/HANDLED

S.No	Title	Sponsoring Agency/Role	Period
1	Development and Demonstration of PEM based Electrochemical Methanol Reformer for Hydrogen Production	Dept.of Science &Technology / <b>Principal Investigator</b>	Two years (2016-2018) <b>On-going</b>
2	Electrochemical Synthesis of $\alpha$ -Aluminium Hydride an advanced Propellant Ingredient	DRDO <b>Co- Principal Investigator</b>	Three years (2016-2019) <b>On-going</b>
3	Design and development of rechargeable Zinc-Nickel and Zinc Air Battery for energy storage application.	DST, TRC Project <b>As Team member</b>	Five years 2015-2020 <b>On-going</b>
4	Development and Manufacturing of metallic Flow field Plates by hydro forming method for PEM Fuel cells	Dept.of Science &Technology <b>Co- Principal Investigator</b>	Three years (2016-2019) <b>On-going</b>
5	Development & Demonstration of PEM based Electrochemical Methanol Reformer for H <sub>2</sub> Production (1.0 Nm <sup>3</sup> /hr)	In house project <b>Principal Investigator</b>	2011-13 <b>Completed</b>

## ACCOMPLISHMENT AS A TEAM MEMBER/LEADER IN PROCESS KNOW-HOW DEVELOPMENT

- Technology development for “Electrochemical Hydrogen Compressor”. Know-how transferred to M/s.Eastern Electrolyser Ltd. New Delhi in Aug’2009.
- Technology development for “Activated Nickel Electrodes for Alkaline Water Electrolyzer”. Know-how transferred to M/s.Eastern Electrolyser Ltd. New Delhi, in April’ 2009.
- Developed and demonstrated 200 W Hydrogen/Air Polymer Electrolyte Membrane (PEM) fuel cell systems and supplied to Military College of Electronics and Mechanical Engineering College , Secunderabad in May’ 2007.
- Electrolytes developed for “White and Yellow Bronze Coatings” for decorative applications. Technology transferred to M/s.K.M. Gadia & Sons, Bangalore in July’2006.
- Process developed for “Electro-deposition of Nickel-Diamond Composite Coatings” . Know-how transferred to (i) M/s. L.M. Van Moppes Diamond Tools India Pvt. Ltd. Chennai in Sep’2002. (ii) M/s. Control System & Service Engineers. Jaipur in June’2005

## PATENTS APPLICATION

1. "A Polymer Electrolyte Membrane (PEM) cell and a method of producing hydrogen from aqueous organic solutions in pulse current mode"  
K.S.Dhathathreyan, **R.Balaji**, K.Ramya, N.Rajalakshmi.  
Indian Patent Application no. 3313/DEL/2012.
2. "Exfoliated Graphite separator based Electrolyzer for Hydrogen generation".  
K.S.Dhathathreyan, **R.Balaji**, K.Ramya, N.Rajalakshmi, L.Babu, R.Vasu, P.Sarangan,  
R.Parthasarathy  
Indian Patent Application no. 3073/DEL/2013

## INTERNATIONAL PUBLICATIONS

1. Electrochemical methanol reformation (ECMR) using low cost sulfonated PVDF/ZrP membrane for Hydrogen Production  
N.Manjula, **R.Balaji**, K.Ramya, N.Rajalakshmi K.S.Dhathathreyan, A. Ramachandraiah  
Submitted to *Journal of Solid State Electrochemistry*, 2017
2. Influence of ethyl acetate as a contaminant in methanol on performance of Electrochemical Methanol reforming (ECMR) for hydrogen production  
N.Manjula, **R.Balaji**, K.Ramya, N.Rajalakshmi K.S.Dhathathreyan, A. Ramachandraiah  
*Int. J. Hydrogen Energy*, 43(2) **2018**, 562-568.
3. An improved method of water electrolysis – effect of complexing agent.  
S.Seetharaman, **R.Balaji**, K.Ramya, K.S.Dhathathreyan, M.Velan  
*Journal of Electrochemical Science and Engineering*, 6(3), **2016**, 215-223.
4. Studies on development of Titanium oxide Nano Tube (TNT) based ePTFE–Nafion–composite membrane for electrochemical methanol reformation  
N.Manjula, **R.Balaji**, K.Ramya, K.S.Dhathathreyan, A. Ramachandraiah  
*Int. J. Hydrogen Energy*, 41 **2016**, 8777- 8784.
5. Palladium Nanoparticles as Hydrogen Evolution Reaction (HER) electrocatalyst in Electrochemical Methanol Reformer  
K. Naga Mahesh, **R. Balaji**, K.S. Dhathathreyan  
*Int.J. Hydrogen Energy* 41 ,**2016**, 46-51
6. Studies Noble metal free carbon based cathodes for Magnesium–Hydrogen peroxide fuel Cells.  
K. Naga Mahesh, **R. Balaji**, K.S. Dhathathreyan  
*Ionics*, 21(9), **2015** 2603-2607.
7. Electrochemical behaviour of nickel based electrodes for oxygen evolution reaction in alkaline water electrolysis  
S.Seetharaman, **R.Balaji**, K.Ramya, K.S.Dhathathreyan, M.Velan  
*Ionics*, Springer 20(5), **2014**, 713-720.
8. Graphene oxide modified non noble metal electrode for alkaline anion exchange membrane water electrolyzer"  
S.Seetharaman, **R.Balaji**, K.Ramya, K.S.Dhathathreyan, M.Velan.  
*Int. J. Hydrogen Energy*, 38, **2013**, 14934-14942.

9. Studies on polymer modified metal oxide anode for oxygen evolution reaction in saline water  
R Venkatkarthick; S Elamathi; D Sangeetha; **Balaji Rengarajan**; B Suresh Kannan; S Vasudevan; D Jonas Davidson; G Sozhan; Subbiah Ravichandran  
*Journal of Electroanalytical Chemistry*, 697, **2013**, 1-4.
10. Operation method study based on the energy balance of an independent microgrid using solar-powered water electrolyzer and an electric heat pump “  
Shin'ya Obara, Seizi Watanabe, **Balaji Rengarajan**  
*Energy*, 36(8), **2011**, 5200-5213.
11. “Operation planning of an independent microgrid for cold regions by the distribution of fuel cells and water electrolyzers using a genetic algorithm”  
Shin'ya Obara, Seizi Watanabe, **Balaji Rengarajan**  
*Int. J Hydrogen Energy*, 36(22), **2011**, 14295-14308
12. Operational Planning of an engine generator using a high pressure working fluid composed of CO<sub>2</sub> hydrate  
Shin'ya Obara, Takanobu Yamada, Kazuhiro Matsumura, Shiro Takahashi, Masahito Kawai, **Balaji Rengarajan**  
*Applied Energy*, 88(12) **2011**, 4733-4741
13. Sulfonated polystyrene-block-(ethylene-ran-butylene)-block-polystyrene (SPSEBS) membrane for sea water electrolysis to generate hydrogen.  
S. Ravichandran , **R. Balaji**, B. Suresh Kannan, S. Elamathi, D.Sangeetha, J.Lakshmi, S.Vasudevan and G. Sozhan  
*ECS Transactions*, 33 (27) **2011**, 157-166
14. Unconventional Hydrogen Compression in an electrochemical method.  
S.Navaneethakrishnan, G.Sozhan,S.Vasudevan,S.Ravichandran, **Rengarajan Balaji**,  
*Jordan Journal of Mechanical and Industrial Engineering*. **2011**
15. Development and Performance evaluation of polymer electrolyte membrane (PEM) based hydrogen generator for portable applications  
**R.Balaji**, N.Senthil, S.Vasudevan, S.Ravichandran, G.Sozhan.  
*Int.J.Hydrogen Energy*, 36 **2011**, 1399-1403.
16. An alternative approach to selective sea water oxidation for hydrogen production  
**R.Balaji**, B.Suresh Kannan,J.Lakshmi, S.Vasudevan, G.Sozhan, A.K Shukla,S.Ravichandran.  
*Electrochemistry Communication* 11(8) **2009**, 1700-1703.
17. Aqueous methanol electrolysis using proton conducting membrane for hydrogen production.  
G.Sasikumar A.Muthumeena, S.Sundar Pethaiah,N.Nachiapan and **R. Balaji**.  
*Int. J.of Hydrogen energy*. 33, **2008**, 5905-5910.
18. Electrochemical regeneration of chromium containing solution from metal finishing industry  
S.Vasudevan, G. Sozhan, S. Mohan, **R. Balaji**, Malathy Pushpavanam, and S.Pushpavanam  
*Ind. Eng. Chem. Res.* 46, **2007**, 2898-2901.
19. Recovery of chromium from the solid residue by In-Situ- generated hypochlorite.  
G. Sozhan, S. Mohan, S. Vasudevan, **R. Balaji** and S. Pushpavanam  
*Ind. Eng. Chem. Res.* 45, **2006**, 7743-7747.
20. Electrodeposition of bronze–PTFE composite coatings and study on their tribological

characteristics.”

**R. Balaji**, Malathy Pushpavanam, K. Yogesh Kumar, K. Subramanian  
*Surface & Coatings Technology* 201, **2006**, 3205-3211.

21. *Electrodeposition of Copper-Tin-Ptfe composite coatings.*  
**Balaji, R.** and Pushpavanam, M. and Yogeshkumar, K. and Subramanian  
*Indian Surface Finishing*, 3 (3-4) **2006**, pp. 381-391. ISSN 0972-9364
22. Methane sulfonic acid in electroplating related metal finishing industry.  
**R. Balaji** and Malathy Pushpavanam  
Translated and Published by *Electroplating and Finishing in China* 23(5), **2004**, 40-45.
23. Methane Sulfonic Acid in Electroplating Related Metal Finishing Industry  
**R. Balaji** and Malathy Pushpavanam  
*Transaction of Institute of Metal Finishing* 81(5), **2003**, 154-158.

## BOOK CHAPTER

1. Nano Materials for Fuel cell Technology”  
K.S.Dhathathreyan, N.Rajalakshmi, **R.Balaji**  
Chapter24 in Book of Nanotechnology for Energy Sustainability, PP-659-595  
Editor: Marcel Van de Voorde, Baldev Raj, Yashwant Mahajan, Publisher:WILEY-VCH, ISBN: 978-3-527-34014-9 2016.

## INTERNATIONAL CONFERENCE/ PROCEEDINGS

1. Studies on evaluation of stainless steel as bipolar plates for PEM fuel cell  
R.Balaji, Akilesh Nair, N.Rajalakshmi.  
International conference on Electrochemical Science &Technology (ICONEST-2017)  
IISc, Bangalaoe during 10-12 Aug'2017.
2. Methanol-Water electrolysis using TNT based composite membrane for hydrogen gas Generation  
N.Manjula, R.Balaji, K.Ramya, K.S.Dhathathereyan, A. Ramachandraiah  
Paper presented in National Conference on Advanced Functional Materials (NCAFM-15) at SRM University, Chennai on May 8-9, **2015**
3. Hydrogen Generation via Urea electrolysis using Nickel alloy electrode  
L.S.Ranjani, **R.Balaji**, K.Ramya, K.S.Dhathathereyan  
Paper Presented in National Symposium on electrochemical Science and Technology (NSEST- 13) at Indian Institute of Science, Bangalore on Aug 23-24, 2013
4. Carbon Assisted Water Electrolysis for Hydrogen Generation  
S.Sabareeswaran, **R.Balaji**, K.Ramya, N.Rajalakshmi, K.S.Dhathathereyan  
AIP conference proceedings, 1538, 43-47 (2013)
5. Synergistic effect of stabilizer in alkaline water electrolysis  
S.Seetharaman, **R.Balaji**, K.Ramya, K.S.Dhathathereyan, M.Velan  
Paper Presented in Seventeenth National convention of Electrochemists (NCE-17) at B.S.Abdur Rahman University, Chennai on 14-15<sup>th</sup> Sep' 2012
6. Sulfonated polystyrene-block-(ethylene-ran-butylene)-block-polystyrene (SPSEBS) membrane for sea water electrolysis to generate hydrogen

S. Ravichandran, **R. Balaji**, B. Suresh Kannan, S. Elamathi, D. Sangeetha, J. Lakshmi, S. Vasudevan, G. Sozhan.  
218th ECS Meeting Las Vegas, USA, on October 10-15, **2010**.

7. Electrochemical compression of hydrogen  
G. Sozhan, S. Vasudevan, S. Ravichandran, **R. Balaji**, S. Navaneethakrishnan, V. Sankari, J. Lakshmi  
217<sup>th</sup> ECS Meeting, Canada, on April 25-30, **2010**.
8. Hydrogen production from renewable energy sources  
**R. Balaji**, Shinya Obara  
*SAEST News letter, India 2009, 4(3), 1.*
9. Water oxidation on various carbon electrodes  
S. Ravichandran, S. Vasudevan, G. Sozhan, N. Senthyl, **R. Balaji**, J. Lakshmi  
3<sup>rd</sup> International conference on Electrochemical Power Systems (ICEPS-3),  
Trivanandapuram, India on Nov 26-28, **2008**.
10. Comparative performance of copper electro deposition from sulphonate and sulfate bath  
**R. Balaji** and Malathy pushpavanam  
Futuristic aspect of Electrochemical Science and Technology held at CECRI, Karaikudi, India on July **2003**.
11. Recovery of chromium value from the solid residue of chromate plant”  
S. Pushpavanam, G. Sozhan, S. Mohan, S. Vasudevan, and **R. Balaji**.  
7<sup>th</sup> International Symposium on Advances in Electrochemical Science and Technology  
Chennai, India on Nov’27-29 **2002**.
12. Recovery of chromium from chromate plant solid effluent”  
S. Pushpavanam, G. Sozhan, S. Mohan, and **R. Balaji**.  
14<sup>th</sup> International forums on applied electrochemistry’ held at Florida, USA, on Nov. 12-16, **2000**.

#### INVITED TALK DELIVERED

1. “The role of Material sciences in the development of Hydrogen Energy Technology” At Faculty Development Programme at ICTE QIP sponsored Workshop on “Frontiers in Materials Research for Energy Applications in Thiagarajar College of Engineering (TCE), Madurai. On 16<sup>th</sup> Dec 2017.
2. Hydrogen fuel cell Technology-An Introduction” Seminar on Renewable Energy, conducted by Rural Energy Centre, Gandhigramam Rural Institute, Gandhigramam, Tamilnadu on 15<sup>th</sup> Dec’ 2017.
3. “Hydrogen Energy- The perfect Energy source for sustainable Living” at workshop on Energy Technologies in Vellore Institute of Technology, Vellore, Tamilnadu on 09<sup>th</sup> Nov 2017.
4. An overview of current developments in hydrogen energy technology” at National Seminar on "Recent Advancements in Energy Storage Technologies for Smart Grid Applications" in Mahalingam college of Engineering and Technology, Pollachi, Tamilnadu on 17<sup>th</sup> Dec 2016.

5. Hydrogen Production Technology-An overview at Seminar in Neyveli Lignite Corporation Engineers Training centre, Neyveli, Tamilnadu on 10<sup>th</sup> June 2016.
6. "Hydrogen-fuel of future" at the National conference on Recent Development in chemistry, Sacred Heart College, Tirupattur, Vellore Dist. Tamilnadu on 24<sup>th</sup> Feb 2016.
7. Hydrogen fuel cell Technology-An Introduction" Seminar on Renewable Energy, conducted by Rural Energy Centre, Gandhigramam Rural Institute, Gandhigramam, Tamilnadu on 18<sup>th</sup> Jan' 2016.
8. PEM fuel cell technology for Sustainable future" at the National conference on Frontiers chemistry and Environment held at Dept of Chemistry, Abdul Hakeem College of engineering, Vellore on March 28, 2015.
9. "Material Aspects of Electrolytic Hydrogen generation" at the " National Conference on Advanced Materials in energy and Environmental Applications held at Dept of Physics, Bharathiyar University, Coimbatore on March 20,2015
10. Electrochemistry and its application-An introduction " Workshop on Functional coatings Recent Trend at Thiagarajar College of Engineering, Madurai, Tamilnadu on 6<sup>th</sup> March 2015
11. Hydrogen and Fuel cell Technologies for Sustainable Future" Workshop on Fuel cell Technology at SCAD Engineering College, Tirunelveli, on 5<sup>th</sup> Jan 2015.
12. Hydrogen Energy Technology-An Overview " Guest Lecture for M.Tech Programme at Rural Energy Centre, Gandhigramam Rural Institute, Gandhigramam, Tamilnadu on 15<sup>th</sup> Dec' 2014.
13. Recent Trend in Hydrogen Production Technologies" National Seminar on Recent Research Trend in Chemistry Conducted by Abdul Hakeem College, Vellore, 26<sup>th</sup> Sep 2014.
14. Hydrogen fuel cell Technology-An Introduction" Seminar on Renewable Energy, conducted by Rural Energy Centre, Gandhigramam Rural Institute, Gandhigramam, Tamilnadu on 13<sup>th</sup> Dec' 2013.
15. "Hydrogen Generation by Electrolysis of Water-A Green Route" Seminar on Green Chemistry, Conducted by Dept. of Chemistry, Global Institute of Engg. & Technology, Vellore, Tamilnadu on 9<sup>th</sup> Nov 2013.
16. An Overview on hydrogen fuel cell technology" National Seminar on Current Scenario of Renewable Energy Resources in India, Conducted by Arulmigu Meenakshi amman college of Engineering, Kancheepuram, Tamilnadu on 19<sup>th</sup> Oct 2013.
17. Hydrogen-The fuel for Sustainable living" Chemistry Department Association meeting, Thiagarajar College of Engineering, Madurai, Tamilnadu on 6<sup>th</sup> Sep 2013.
18. Green electrolytes for Electrodeposition" National Seminar on "Green Chemistry" conducted by KSR College of Engineering, Thiruchengode, Tamilnadu, on 16<sup>th</sup> Feb 2012.
19. "Hydrogen Energy Technologies" Faculty Development Programme, Anna University Coimbatore, Tamilnadu, India, on 24<sup>th</sup> Dec 2011.

## AWARDS AND HONOURS

- Received Outstanding Scientist Award in the field of hydrogen Energy Technology from Venus International Foundation, Chennai during Dec 2016.
- Biographical Profile selected and included in 32<sup>nd</sup> Edition of Marquis Who's who in the World' 2015.
- Cash prize award for the best paper, Electroplating and finishing in China, 2004.

## EDITORIAL EXPERIENCE

- Reviewer in following International Journals

International Journal of Hydrogen energy (ISSN 0360-3199)

Corrosion Science (ISSN 0010-938X)

Spectroscopy letters

Surface and coating Technology (ISSN 0257-8972)

Ceramic International (ISSN: 0272-8842)

Portugaliae Electrochimica Acta (ISSN 1647-1571)

Ionics (ISSN 1862-0760)

Journal of Materials Science-Materials in electronics (ISSN: 1573-482X)

International journal of Energy Engineering (ISSN: 2225-6571)

Chemical Engineering and Processing: Process Intensification (ISSN: 0255-2701)

Nanoscale Research Letters (ISSN: 1556-276X)

Waste Management journal, (ISSN 0956-053X)

## MEMEBERSHIP IN PROFESSIONAL BODIES

- Fellow Member - Society for Advancement of Electrochemical Science and Technology (SAEST), India
- Anna university, Chennai Recognized PhD degree supervisor (No. **2170056**)
- Guest lecturer at Gandhigramam Rural Institute, Gandhigramam, Tamilnadu.
- Doctoral committee member at  
Department of Chemical Engineering, Anna University, Chennai,  
Department of Chemistry, Sathyabama University, Chennai.  
Department of Chemistry, SRM University, Kattangulathur, Chennai
- Ph.D viva-Voice External Expert examiner/member at Dept. of Chem. Engg. Anna University, Chennai.TN

## ACADEMIC THESIS SUPERVISION

Degree	Numbers
Post Doctoral Fellow	01
Ph.D (Co-supervisor)	04 (on-going)
M.Tech/M.E	03
M.Phil	03
M.Sc	16
B.Tech	05