



## Dunaboyina Sri Maha Vishnu

Associate Professor

*Biological Sciences and Chemistry (DBSC) - Chemistry Section, & Research Center for Energy, Materials, Metallurgy and Semiconductor (RCEMMS)  
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Time at UoN: Since 2014

Marital Status: Married....

Received Ph.D. in Chemistry from the University of Homi Bhabha National Institute, Mumbai, India in 2014, M.Sc. in Chemistry from Pondicherry University, Pondicherry, India in 2008, and B.Sc. in Chemistry from Pondicherry University, Pondicherry, India in 2006. His research interests are Materials chemistry, Nanomaterials, molten salt chemistry, Electrochemistry, Corrosion, Electrometallurgy, Ti based biomedical implant materials, and Energy storage materials.

### **Academic Qualifications**

Ph.D. (Chemistry), Homi Bhabha National Institute, 2014

M.Sc. (Chemistry), Pondicherry University, 2008

B.Sc. (Chemistry), Pondicherry University, 2006

### **Teaching Activities**

Materials Chemistry

Physical Chemistry for Engineers

Biophysical Chemistry

Analytical Chemistry for Pharmacy

Analytical Chemistry-II

Fundamentals of Chemistry

Environmental Chemistry

Materials for Sustainable Energy Applications

Advanced Analytical Chemistry

Advanced Materials Chemistry

General Chemistry-II

Polymer Chemistry

Special Topics in Electronics, automation and biosensors

Analytical Chemistry-I

General Chemistry-I

Pharmaceutical Analysis

## **Research Activities**

### **- Research Interests**

Materials chemistry, molten salt chemistry, Electrochemistry, Corrosion, Electrometallurgy, Ti based biomedical implant materials, Energy storage materials and Nanomaterials

### **- Conference Presentations**

Synthesis of nano-sized high-entropy carbide powder by electrochemical deoxidation for possible application in supercapacitors, 11th Internation Workshop on Advanced Materials (IWAM-2019), Ras Al Khaimah, UAE., 24th - 26th February, 2019

Porous Ti alloys with non-cytotoxic Nb and Sn for body-implant applications, 11th International Workshop on Advanced Materials (IWAM-2019), Ras Al Khaimah, UAE., 24th - 26th February, 2019

Electrochemical reduction of sintered titania powders to titanium metal in calcium chloride melt, Minerals and Metals Production from Mine to Market, Trinity Hall, Cambridge, United

Kingdom. , 15th - 16th, December 2015

Electrochemical synthesis of Ti matrix based composite materials in molten salts, 6th International round table conference on titanium production in molten salts (TiRT - 2018), Reykjavik University, Reykjavik, Iceland., 10-13th June (2018)

Electrochemical Synthesis of Silicon Carbide in Molten Calcium Chloride, 2nd International Conference on Electrochemical Science and Technology (ICONEST - 2017), Indian Institute of Science Campus, Bengaluru, India., 10-12th August (2017)

Direct electrochemical synthesis of Ti-35Nb-7.9Sn alloy from mixed oxide discs in CaCl<sub>2</sub> melt, Molten Salt Discussion Group - Summer Research Meeting-2017, School of Chemical and Environmental Engineering, University of Nottingham, organized by Royal Society of Chemistry, Nottingham, UK., 4th -6th July (2017)

Molten salt electrochemical synthesis of porous titanium-niobium biomedical alloys, 26th EUCHEM conference on Molten Salts and Ionic Liquids, Vienna, Austria, 3rd -8th July, 2016

Electrochemical synthesis of ferrochromium by electro-reduction in molten salts, 26th EUCHEM conference on Molten Salts and Ionic Liquids, Vienna, Austria, 3rd - 8th July, 2016

Studies on the Electro-deoxidation of CeO<sub>2</sub> in the FFC Cambridge process, Second International Conference on Advances in Nuclear Materials (ANM), Mumbai, India, February 9-11, 2011

Electrodeoxidation of niobium pentoxide in molten calcium chloride medium, 3rd International Symposium on Materials Chemistry (ISMC), Bhabha Atomic Research Centre, Trombay, Mumbai, December 7-11, 2010

Preliminary results on the role of calcium during electro-reduction of solid oxides in molten calcium chloride medium, DAE-BRNS Biennial Symposium on Emerging trends in separation Science and Technology (SESTEC), Mumbai, India, February 27 - March 01, 2012

Estimation of uranium in UO<sub>2</sub> partially reduced by electro-deoxidation, Fourth International Symposium on Nuclear Analytical Chemistry (NAC-IV), Bhabha Atomic Research Centre, Mumbai, India, November 15-19, 2010

Studies on electro-deoxidation of metal oxides in molten calcium chloride medium, Chemistry Research Scholars Meet (CRSM), IGCAR, Kalpakkam, India, July 14-15, 2011

An innovative study of the electrochemical reduction of solid SiO<sub>2</sub> in LiCl and CaCl<sub>2</sub> melts, DAE-BRNS 4th Interdisciplinary Symposium on Materials Chemistry (ISMC), BARC, Trombay, Mumbai, India, December 11-15, 2012

Studies on the direct electrochemical reduction of Nb<sub>2</sub>O<sub>5</sub> in MCl (M=Na and K), CaCl<sub>2</sub>-75 mol % KCl and CaCl<sub>2</sub> melts, International Conference on Vistas in Chemistry (ICVC), IGCAR,

Kalpakkam, India, October 11-13, 2011

Galvanostatic studies on the electro-deoxidation of solid titanium dioxide in molten calcium chloride, FRAY International symposium on Metals and Materials Processing in a clean environment, Cancun, Mexico, November-2011

**- Publications**

**Article:**

1. 2021 [Factors controlling the synthesis of porous Ti-based biomedical alloys by electrochemical deoxidation in molten salts](#), Metallurgical and Materials Transactions B (2021) (in press)
2. 2021 Corrosion performance of electrochemically prepared Ti-5Ta-2Nb alloy in concentrated nitric acid, Materials Today Communications 26 (2021) 1-11 (Article No. 101786)
3. 2020 Microwave-assisted synthesis of palladium nanoparticles using Frankincense resin and evaluation of their catalytic properties, Materials Letters 278 (2020) 1-4 (Article No. 128427)
4. 2020 Facile and scalable electrochemical synthesis of Ta-Nb alloy powders for capacitors, Journal of the Electrochemical Society 167 (2020) 1-9 (Article No. 022504)
5. 2020 Preparation of refractory high-entropy alloys by electro-deoxidation and the effect of heat treatment on microstructure and hardness, JOM 72 (2020) 3895-3905
6. 2020 [Facile Electrochemical Synthesis of Nanoscale \(TiNbTaZrHf\)C High-entropy Carbide Powder](#), Angwandte Chemie International Edition, 59 (2020) 1-7
7. 2019 Molten salt based direct solid state electrochemical de-oxidation of metal oxides to metal: Our experience at IGCAR, SMC Bulletin 10 (2019) 70-87
8. 2019 Phase composition, microstructure, corrosion resistance and mechanical properties of molten salt electrochemically synthesised Ti-Nb-Sn biomedical alloys, Materials Transactions 60 (2019) 422-428
9. 2019 Electrochemical synthesis of porous Ti-Nb alloys for biomedical applications, Materials Science and Engineering C 96 (2019) 466-478
10. 2019 Molten Salt Electrochemical Synthesis, Heat Treatment and Microhardness of Ti-5Ta-2Nb Alloy, Materials Transactions 60 (2019) 391-399
11. 2019 Electrochemical Conversion of Oxide Spinel into High-Entropy Alloy, Journal of Alloys and Compounds 776 (2019) 133-141

12. 2018 Direct electrochemical preparation of silicon carbide in calcium chloride melt and its nitridation behavior, *Journal of the Electrochemical Society* 165 (2018) D731-D742

13. 2017 Direct electrochemical synthesis of high-entropy alloys from metal oxides, *Applied Materials Today* 9 (2017) 111-121

14. 2017 Measurement of counter electrode potential during cyclic voltammetry and demonstration on molten salt electrochemical cells, *International Research Journal of Pure and Applied Chemistry* 15 (2017) 1-13

15. 2017 Difference in the mechanism of electrochemical deoxidation of conducting and non-conducting solid oxide preforms: An experimental demonstration with  $TiO_2$  and  $SiO_2$  pellet electrodes in  $CaCl_2$  melt, *Research Reviews: Journal of Materials Science* 5 (2017) 1-12

16. 2017 Factors influencing the direct electrochemical reduction of  $Nb_2O_5$  pellets to Nb metal in molten chloride salts, *Acta Metallurgica Sinica (Engl. Lett.)* 30 (2017) 218-227

17. 2016 Electrochemical conversion of solid  $Nb_2O_5$  to Nb in sodium chloride melt as proof of oxygen ionisation mechanism of electrodeoxidation, *Journal of Alloys and Compounds* 677 (2016) 258-265

18. 2016 Electrochemical characterisation of  $CaCl_2$  deficient  $LiCl-KCl-CaCl_2$  eutectic melt and electro-deoxidation of solid  $UO_2$ , *Journal of Nuclear Materials*, 470 (2016) 179-186

19. 2015 Corrosion of high density graphite anodes during direct electrochemical de-oxidation of solid oxides in molten  $CaCl_2$  medium, *Carbon*, 93 (2015) 782-792

20. 2015 Electrochemical reduction of  $TiO_2$  powders in molten calcium chloride, *Electrochimica Acta*, 159 (2015) 124-130

21. 2014 A novel technique for estimation of metallic uranium using proton exchange membrane based hydrogen sensor, *Transactions of Indian Institute of Metals*, 67 (5) 691-699 (2014)

22. 2013 Factors influencing the direct electrochemical reduction of  $UO_2$  pellets to uranium metal in  $CaCl_2$ -48mol%  $NaCl$  melt, *Journal of Electrochemical Society*, 160 (11) D583-D592 (2013)

23. 2013 Mechanism of direct electrochemical reduction of solid  $UO_2$  to uranium metal in  $CaCl_2$ -48mol% $NaCl$  melt, *Journal of the Electrochemical Society*, 160 (9) (2013) D394-D402

24. 2013 A study of the reaction pathways during electrochemical reduction of dense  $Nb_2O_5$  pellets in molten  $CaCl_2$  medium, *Electrochimica Acta*, 100 (2013) 51-62

25. 2012 Determination of the extent of reduction of dense  $UO_2$  cathodes from direct electrochemical reduction studies in molten chloride medium, *Journal of Nuclear Materials*,

## **Faculty Administrative Experience**

2020 - Present: Member of DBSC Quality Management Group

2020 - Present: DBSC Risk Management Officer

2020 - Present: B.Sc., Chemistry Program Coordinator

## **Membership in Professional Bodies**

2015-Present: Member of Royal Society of Chemistry (MRSC), United Kingdom

2011-Present: Member of Society for Materials Chemistry (MSMC), India

Dr. Dunaboyina Sri Maha Vishnu obtained his B.Sc. (Chemistry) and M.Sc. (Chemistry) degrees from Pondicherry University, India and Ph.D. (Chemistry) degree in 2014 from Homi Bhabha National Institute, Mumbai, India. His Ph.D. was in the area of non-aqueous electrochemistry and electroanalytical chemistry with particular emphasis on electrochemical synthesis of materials and their characterization using advanced techniques. Later, he worked at the Department of Materials Science and Metallurgy, University of Cambridge, UK during the period from 17/11/2014 to 07/09/2018. He has been working on various research projects such as developing porous Ti based biomedical alloys for body implant applications and their corrosion chemistry, synthesis of carbon and carbide based nanomaterials for their energy storage applications in lithium ion batteries and supercapacitors, non-aqueous electrochemistry and electrometallurgy for synthesis of novel materials, electrochemical synthesis of alloys and composite materials and evaluation of corrosion behaviour of structural alloys used in petroleum, petrochemical and chemical industries. Dr Vishnu has extensive hands-on experience in handling a remarkably wide range of laboratory equipment. This includes regular laboratory equipment, such as high-temperature furnaces, glove boxes, electrochemical retorts, ball mills, cutting machines, grinding and polishing machines, and sputter coaters; electrochemical instruments, such as potentiostats, impedance analysers, and data acquisition systems; equipment for advanced materials characterisation techniques, such as X-ray diffractometer (XRD), scanning electron microscope with energy-dispersive X-ray analyser (SEM-EDX), transmission electron microscope, simultaneous thermogravimetric analyser and differential scanning calorimeter (TGA/DSC), Raman spectrophotometer, and optical microscope; advanced analytical instruments, such as

ICP-OES, and metallurgical oxygen analyser; as well as mechanical testing instruments, such as 4-point bend tester and hardness tester. So far he has published 18 international research articles with many more under review/preparation pending publication. He has presented his research work at 23 international conferences/seminars/workshops through oral and poster presentations. Currently he is an active reviewer for the well known international journals such as *Electrochimica Acta*, *Journal of Electrochemical Society*, *Journal of Materials Science*, *Transactions of Nonferrous Metals Society of China*, *Transactions of the Institutions of Mining and Metallurgy Journals (TIIM C)* and so on. He is a Member of Royal Society of Chemistry (MRSC, Membership No. 590988), UK since 2015 and Member of Society for Materials Chemistry (SMC, Membership No. 446), Mumbai, India since 2011.

Ref.: <https://www.unizwa.edu.om/staff/cas/vishnu>