Santhosh S Nair, PhD

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**Ambitious R&D chemist with more thanfive years of experience in industrial (Petroleum refinery) and academic research laboratories (Materials-Polymer/inorganic). With a strong focus on materials synthesis, processing, characterization to develop new products or to enhance the properties of existing once. Proven expertise in determining ways to design new hybrid materials by combining inorganic and organic nanomaterials for energy and environmental applications.**

# KEY STRENGTHS

* Over 8 years of solid experience in polymer and inorganic chemistry in analyzing the product requirements and design experiments accordingly. Strong knowledge on both bench level experimentation and pilot plantoperations.
* Excellent command and hands on experience over the analytical and material characterization techniques such as SEM, TEM, AFM, XRD, Microtome, QCM, optical profilometer, contact angle measurement, Four point conductivity measurement and various electrochemical methods, rheometer, particle size analysis, zeta potential analysis, FT-IR, UV, spray Drier and hardness and strength measurements, BET surface area analyser, CHNS analyser, Refinery gas analyser, ICP- OES, XRF, HPLCetc.
* Expertise in material synthesis. Conducting polymer thin films, polymer nanofibers, polymer additives, metal /metal oxide nanostructures (titanium dioxide, zinc oxide), graphene (colloidal and CVD), sol-gel synthesis of ceramics, low-temperature synthesis, organic reactions, hydrothermal techniquesetc.
* Hands on experience in pilot plant operations for refinery support operations such as TBP andFCC
* Hands on experience on material processing techniques such as electrospinning, vapor phase polymerization, Layer by layer coating, Sol-gel coating, colloidal processing of ceramics (slip casting/gel casting)etc.
* Profound ability to define technical targets, write technical reports, and communicating science through peer- reviewed articles and oralpresentations. Published seven peer reviewed publications and one patent application.
* Excellent communication skills (in English) and interpersonal skills which help to work in a demanding, time bound, multicultural highly hierarchicalenvironment.

# RESEARCH CHEMIST

Biofinox, Research Scientist Jun 2018- till date

* Heading the R&D Electrochemical food sensor division, Consultant for elvikon (nanomaterials division)

Stockholm University, Postdoctoral ResearchFellow,Sweden Nov 2015 –Nov 2017

* Synthesis of novel nanocomposites of bio-nanoparticles (cellulose nanocrystals, chitin nanocrystals)using the composite polymer electrospinning and electrospraying for water purificationapplications. Development of low temperature synthesis of TiO2 nanowires on polymer substrates for catalysis
* Plan, schedule, conduct, and coordinate detailed phases of work that involve in electrospinning, characterization, data interpretation, research investigations and applicationdevelopment.
* Techniques: electrospinning, SEM, TEM, AFM, BET, Rheology, UV-Vis,ICP-OES, NMR
* Achievement:designedanddeveloped an innovative strategy for synthesizing aporousmembraneofcelluloseacetate to host catalyst particles such as cellulose nanocrystals. Developed a novel method for synthesisin low temperature TiO2 nanowires on polymer substrates including fibers, obtained a postdoctoral research fellowship from Wallenberg Wood Science ResearchCenter.Published 2 peer reviewed journal articles, 1 Patent application pending, 3 articles on various stages of publication.

Gwangju Institute of Science and Technology, Postdoctoral ResearchFellow,S.Korea Jun 2015 –Oct2015

* Development of CVD graphene-based energy devices on flexiblesubstrates
* Techniques: CVD graphene synthesis, hydrothermal synthesis of doped ZnO nanostructures,characterizations using SEM and Keithley current/voltagemeters.
* Achievement: developed a novel method for graphene transfer by tweaking the wettability of the substrate rather than the routine PDMS transfer, hence reduced the fabrication time into 2 days from 7 days with higher success rate.

Monash University, Doctoral student and ResearchFellow, Australia June 2010 – Feb2015

* Synthesis of metal oxide nanowires on PEDOT/Graphene functionalized flexible polymer fibres/sheets to test for various applications. Polyethersulfone was electrospun rendered conducting via either vapour phase polymerization of PEDOT or by the means of modified layer by layer deposition of colloidal graphene with the help of polyelectrolytes. A wearable/flexible energy generator was fabricated and tested. The high surface area “bottle brush structures” were tested for electrocatalytic applications such as wateroxidation
* Techniques: Electrospinning, low-temperature synthesis of quantum dots and metal oxide nanowires, vapour phase polymerization, electrocatalysis, catalyst synthesis and characterization techniques SEM, TEM, AFM, XRD, Microtome, Quartz Crystal microbalance, Optical profilometer, Contact angle measurement, Four point conductivity measurement and various electrochemicalmethods.
* Achievement: Fabricated an innovative piezoelectric nanogenerator which shown 106 times morecurrent

generation and 103 times better voltage generation than the traditional design. Two first authored peer-reviewed articles, 2 co-authored articles, and a PCT application was obtained during the tenure. I also was recipient of two scholarships for the support of my graduate studies (Postgraduate Research & SASE Scholarship)

Chennai Petroleum Corporation Limited, Assistant Chemist(R&D),India Jul 2009 – Jun2010

* Operating pilot plants for petroleum refining operations and analysis of crude petroleum and petroleum distillates fortheproductspecificationofEuro-4andASTMnorms.DetailedanalysisandcharacterisationofEquilibriumand spent catalyst used in various petroleumtreatments.
* Techniques: Pilot plant studies of different crude oil samples for the support of refinery operations (TBP and FCC), Stimulated distillation studies using SIM-dist, analysis of various crude oils and their distillate using ICP OES, Density meter, HPLC, and Sulfur analysis using XRF, analysis of Equilibrium and spent catalyst using different analytical and chemical methods such as BET surface area analyzer, Particle size analysis, Chemisorption studies for metal dispersion, CHNS analysis, Crushing strength analysis, Flame photometer, Elemental quantitative analysis for different catalysts, Attrition Index determination and Refinery Gasanalyser.
* Achievement: Developed a data bank based S and heavy metal content in different crude oil and in distillates using TBP pilot plant and metalanalysis.

ARCI, Hyderabad, Junior ResearchFellow,India Aug 2008 – Jun2009

* Development of nanoparticulate coatings and monolith fabrication by sol-gel synthesis using inorganic and organic precursors of metal oxides for transparent alumina development for defence and sodium vapourlamp applications.
* Techniques: Rheometry, Particle size analysis, Zeta potential analysis, SEM, FT-IR, UV, Spray Drier and Hardness and strengthmeasurements.
* Achievement: Developed an alumina monolith with more than 75% transparency using controlled grain growth sintering and also obtained Junior ARCI Researchfellowship.

# CAREER

* Stockholm University, Postdoctoral Research Fellow,WWSC,Sweden Nov 2015 –Nov 2017
* Gwangju Institute of Science and Technology, Postdoctoral ResearchFellow,S.Korea Jun 2015 –Oct2015
* Monash University, ResearchFellow, Australia Feb 2014 – Feb2015
* Chennai Petroleum Corporation Limited, Assistant Chemist(R&D),India Jul 2009 – Jun2010
* ARCI, Hyderabad, Junior ResearchFellow,India Aug 2008 – Jun2009

# Education

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| * PhD – Chemistry, Monash University,Australia | 2014 |
| * MSc – Chemistry, Gandhigram Rural University,India | 2008 |
| * BSc-Ed – Chemistry, Physics, Mathematics and Education, R.I.E Mysore(NCERT) | 2006 |

**FURTHER TRAINING AND QUALIFICATIONS**

## Diploma in • Computer applications • Principles of project management •six sigma Languages •English •Malayalam •Hindi •Swedish (Elementary- now learning)

**Patent**

1) PCT application published on 12-02-2015 “Nanogenerators and method of manufacture has been filed (WO20151788A1)

**Journal Articles and Conference Presentation**

1. Porous composite membranes based on cellulose acetate and cellulose nanocrystals via electrospinning and electrospraying. Santhosh S Nair and Aji P Mathew. Carbohydrate Polymers 175 (2017) 149–157
   1. Directing the growth of ZnO nano structures on flexible substrates using low temperature aqueous synthesis, [Santhosh S. Nair,](http://pubs.rsc.org/en/results?searchtext=Author%3ASanthosh%20S.%20Nair) [John Forsythe](http://pubs.rsc.org/en/results?searchtext=Author%3AJohn%20Forsythe) and [Bjorn Winther-Jensen](http://pubs.rsc.org/en/results?searchtext=Author%3ABjorn%20Winther-Jensen)\* RSC Adv., 2015,5, 90881-90887, doi: 10.1039/C5RA15453G
   2. New Junction materials by the direct growth of ZnO NWs on organic semiconductors-[Santhosh S Nair\*,](http://pubs.rsc.org/en/results?searchtext=Author%3ASanthosh%20S%20Nair) [Bartlomiej Kolodziejczyk,](http://pubs.rsc.org/en/results?searchtext=Author%3ABartlomiej%20Kolodziejczyk) [Keld West,](http://pubs.rsc.org/en/results?searchtext=Author%3AKeld%20West) [Thomas Steen Hansen,](http://pubs.rsc.org/en/results?searchtext=Author%3AThomas%20Steen%20Hansen) [SamAdeloju,](http://pubs.rsc.org/en/results?searchtext=Author%3ASam%20Adeloju) [John S Forsythe](http://pubs.rsc.org/en/results?searchtext=Author%3AJohn%20S%20Forsythe) and [Bjorn Winther-Jensen\*,](http://pubs.rsc.org/en/results?searchtext=Author%3ABjorn%20Winther-Jensen) *RSCAdvances*, 2015,**5**, 7932–7937;**doi:**10.1039/C4RA15621H
   3. Patterning of conducting layers on breathable substrates using laser engraving for gas sensors. Bartlomiej Kolodziejczyk\*, Orawan Winther-Jensen, Brooke A. Pereira , SanthoshS.Nair, Bjorn Winther-Jensen. Journal of Applied Polymer Science 132, 2015, 42359. doi: 10.1002/app.42359
   4. Photocatalytic water treatment by Titanium dioxide: Recent updates. Manoj A Lazar, Shaji Vargese and Santhosh S Nair. Catalysts **2012**,*2*(4),572-601;doi:[10.3390/catal2040572](http://dx.doi.org/10.3390/catal2040572)
   5. Simultaneous determination of Paracetamol and ascorbic acid using tetraoctyl ammonium bromide capped gold nanoparticles immobilized on 1,6-hexanedithiol modified Au electrode. S.S.Nair, S.AJohn and T.Sagara. Electrochimica Acta 54 (2009) 6837-6843.doi.org/10.1016/j.electacta.2009.06.077
   6. All Cellulose Electrospun Water Purification Membranes Nanotextured using Cellulose Nanocrystals Lee A. Goetz, Narges Naseri, Santhosh S. Nair, Zoheb Karim, Aji P. Mathew, Cellulose,doi.org/10.1007/s10570-018-1751-1
   7. Low temperature growth of single crystalline rutile TiO2 nanorod arrays on polymer 2-Dand 3-D substrates S.S,Nair et al (soon to be submitted)
   8. CNC- TiO2 nanowire hybrids as nanoreactors for photocatalytic water splitting S.S.Nair et al (soon to be submitted)
2. Orientation of CNCs within electrospun matrix with changing electric field B.K.Kyzy et al (soon to be submitted)
3. Flexible PEDOT/ZnO nanogenerators S.S.Nair et al (under preparation)
4. Solution processable graphene based nanognerators. S.S.Nair et al (under preparation)
5. High Volatile solvent electrospinning: A solution for limitations of Polymer blend electrospinning. Santhosh S Nair and Aji P Mathew (Poster presented on WWSC summer conference,Djurönäset, Sweden)
6. Porous electrospun nanocomposite membranes of cellulose acetate and cellulose nanocrystals for water purification. Santhosh S Nair and Aji P Mathew (Poster presented on WWSC winter conference, Åland, Finland)
7. Synthesis of Semiconducting Metal oxide nanowires on Graphene functionalised Electrospun membranes. Santhosh Nair, John Forsythe, Bjorn Winther-Jensen, Walid Daoud and Samuel Adeloju (Oral presentation on ICEAN 2012, Brisbane, Australia, Abstract is published on conference proceedings)
8. Fabrication of Nanogenerator on PEDOT functionalised PES substrates. Santhosh Nair, John Forsythe, Walid Daoud ,Samuel Adeloju and Bjorn Winther-Jensen (Oral presentation on Post Graduate Winter conference ,Monash University, Caulfield)
9. Attended Satellite workshop on soft X ray beamline techniques on Australian Synchroton with hands on experience XPS
10. Green Innovations and Green roots for Organic synthesis Santhosh S Nair (Oral presentation National level Students symposium, National Institute of Technology, Trichi, India)

**Invited Talks**

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1. One dimensional nanostructures –synthesis and applications. KSCSTE sponsored National seminar at St. Joseph`s College, Irinjalakuda, Kerala, India)
2. Inorganic-Organic hybrid structure for energy applications. International seminar at Carmel college, Mala,Kerala, India)

**Scholarships and Awards**

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| **2015-2017** | **Wallenberg Wood Science Research Center, Stockholm University** |
|  | **Postdoctoral Fellowship** |
|  | SEK 22500 per month for 2 years |
| **2010-2013** | **Monash University Gippsland Campus Postgraduate** |
|  | **Research Scholarship Tution Fee Award** |
|  | AUD 88,600.00 for the duration of Course |
| **2010-2013** | **Monash University SASE student living allowance** |
|  | AUD 22,500.00 p.a. for the duration of Course |
| **2008-2009** | **Junior ARCI Fellow, India** |