

# Vaishakh Nair Ph.D.

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## Professional Appointments

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Postdoctoral Fellow Host : Prof. Juan Carlos Colmenares <i>Research Focus: Nanoengineering of thin layers of semiconductor photocatalysts in a microreactor environment for lignin-based model compounds valorization</i>	Institute of Physical Chemistry Polish Academy of Sciences Kasprzaka 44/52, PL-01 224 Warsaw, Poland March <b>2017</b> - February <b>2019</b>
Assistant Professor (on-contract) in Chemical Engineering	National Institute of Technology, Calicut, India (1.5 years experience)

## Education

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PhD in Chemical Engineering Advisor : Prof. R. Vinu <i>Thesis Title: Valorization of lignin and bioresidues via different techniques including catalytic fast pyrolysis, photocatalysis, functionalization and thermochemical activation</i>	Indian Institute of Technology Madras, July <b>2016</b>
Masters in Nanotechnology Advisor: Prof. N. Sandhyarani <i>Thesis Title: Conversion of commercial polyethylene into environmental form using nanotechnology</i>	National Institute of Technology Calicut, October <b>2010</b>
Bachelors in Chemical Engineering	Government Engineering College Calicut, June <b>2008</b>

## Awards and Fellowships

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Sonata-Bis project funded by National Science Centre, Poland	<b>2017-2019</b>
GE Ecomagination Excellence Award for the best Ph.D. Thesis, India	<b>2016</b>
Research Award instituted by Indian Institute of Technology, Madras, India	<b>2015</b>
Gold Medal in the 40th All India Students Design Competition instituted by the National Design and Research Forum, Institution of Engineers (India), India	<b>2009</b>
GATE Fellowship, India	<b>2008</b>

## Scientific Publication

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(15) Dimitrios A. Giannakoudakis, **Vaishakh Nair**, Ayesha Khan, Eleni A. Deliyanni, Juan Carlos Colmenares, and Konstantinos S. Triantafyllidis, Additive-free photo-assisted selective partial oxidation at ambient conditions of 5-hydroxymethylfurfural by manganese (IV) oxide nanorods, *Applied Catalysis B: Environmental*, 2019, DOI:

10.1016/j.apcatb.2019.117803. (I.F – 14.22)

- (14) **Vaishakh Nair**, Mario J. Muñoz-Batista, Marcos Fernández-García, Rafael Luque and Juan Carlos Colmenares, Thermo-photo-catalysis: environmental and energy applications, *ChemSusChem*, 2019, 12, 2098-2116. (I.F – 7.41)
- (13) Suchith Chellappan, Chingakham Ch., **Vaishakh Nair**, Sajith.V and Aparna. K, Microwave assisted biodiesel production using a novel Brønsted acid catalyst based on nanomagnetic biocomposite, *Fuel*, 2019, 246, 268–276. (I.F – 5.12)
- (12) **Vaishakh Nair**, Juan Carlos Colmenares, and Dmytro Lisovytskiy, Ultrasound assisted ZnO coating in microflow based photoreactor for selective oxidation of benzyl alcohol to benzaldehyde, *Green Chemistry*, 2019,21, 1241-1246. (I.F – 9.40)
- (11) Ayesha Khan, **Vaishakh Nair**, Juan Carlos Colmenares, and Roger Gläser, Lignin-based composite materials for photocatalysis and photovoltaics, *Topics in Current Chemistry*, 2018, 364,1-31. (I.F – 5.53)
- (10) Suchith Chellappan,**Vaishakh Nair**, Sajith V and Aparna K, Synthesis, optimization and characterization of biochar based catalyst from sawdust for simultaneous esterification and transesterification, *Chinese Journal of Chemical Engineering*, 2018, 26, 2654-2663. (I.F – 1.91)
- (9) Suchith Chellappan,**Vaishakh Nair**, Sajith V and Aparna K, Experimental validation of biochar based green Bronsted acid catalysts for simultaneous esterification and transesterification in biodiesel production, *Bioresource Technology Reports*, 2018, 2,38-44. (I.F – Nil)
- (8) Juan Carlos Colmenares, **Vaishakh Nair**, Ewelina Kuna and Dariusz Łomot, Development of photocatalyst coated fluoropolymer based microreactor using ultrasound for water remediation, *Ultrasonics Sonochemistry*, 2018, 41, 297-302. (I.F – 7.27)
- (7) Juan Carlos Colmenares, Rajender S. Varma and **Vaishakh Nair**, Selective photocatalysis of lignin-inspired chemicals by integrating hybrid nanocatalysis in microfluidic reactors, *Chemical Society Reviews*, 2017, 46, 6675-6686. (Selected for back cover image) (I.F – 40.44)
- (6) **Vaishakh Nair** and R. Vinu, Peroxide-assisted microwave activated pyrolysis biochars for the removal of dyes from wastewater, *Bioresource Technology*, 2016, 216, 511-519. (I.F – 6.66)
- (5) **Vaishakh Nair** and R. Vinu, Production of guaiacols via catalytic fast pyrolysis of alkali lignin using titania, zirconia and ceria, *Journal of Analytical Applied Pyrolysis*, 2016,119, 31-39. (I.F – 3.47)
- (4) **Vaishakh Nair**, Pyali Dhar and R. Vinu, Production of phenolics via photocatalysis of ball milled lignin-TiO<sub>2</sub> mixtures in aqueous suspension, *RSC Advances*, 2016, 6, 18204-18216. (I.F – 3.04)
- (3) Debalina Bhattacharjee, **Vaishakh Nair**, Jagananatham Mani, Vasanthakumar Kombamuthu, Karthiselva N Sengottaian, R. Vinu, Prathap Haridoss and Srinivasa Bhakshi, Effect of different nano-carbon reinforcements on microstructure and properties of TiO<sub>2</sub> composites prepared by spark plasma sintering, *Ceramic International*, 2016,42, 14266-14277. (I.F – 3.45)
- (2) **Vaishakh Nair**, Ajithesh Panigrahy and R. Vinu, Development of novel chitosan-lignin composites for adsorption of dyes and metal ions from wastewater, *Chemical Engineering Journal*, 2014, 254, 491-502.(I.F – 8.35)
- (1) Reny Thankam Thomas\*, **Vaishakh Nair\*** and N. Sandhyarani, TiO<sub>2</sub> nanoparticle assisted solid phase photocatalytic degradation of polythene film: A mechanistic investigation, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2013, 422, 1-9. (\* denotes equal author contribution) (I.F – 3.09)

## Book Chapter

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- (1) R. Vinu, D.K.Ojha and **Vaishakh Nair**, Polymer pyrolysis for resource recovery. *Elsevier Reference Module in Chemistry, Molecular Sciences and Chemical Engineering*, 2016, <http://dx.doi.org/10.1016/B978-0-12-409547-2.11641-5>.

## Conference

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- (6) Juan Carlos Colmenares, **Vaishakh Nair** and Tomasz Danko, High value chemicals from lignin model compounds in a photocatalytic microfluidic reactor: TiO<sub>2</sub> vs. ZnO, *4<sup>th</sup> Iberoamerican Congress on Biorefineries*, 24-26 Oct. 2018, Jaén, Spain.
- (5) **Vaishakh Nair**, Juan Carlos Colmenares and Tomasz Danko, Selective photooxidation of lignin model compound- benzyl alcohol in a ZnO coated microfluidic reactor, *4<sup>th</sup> International Conference on Bioinspired and biobased Chemistry and Materials*, 14 – 17 Oct. 2018, Nice, France.
- (4) Suchith Chellappan, Chingakham Ch., **Vaishakh Nair**, Sajith.V and Aparna. K, Microwave assisted biodiesel production using a novel catalyst based on nanomagnetic biocomposite, *1<sup>st</sup> International Conference on Energy and Environmental Global Challenges (ICEE-2018)*, 9-10 Mar. 2018, National Institute of Technology Calicut, Calicut, India.
- (3) Juan Carlos Colmenares, **Vaishakh Nair**, Agnieszka Lewalska-Graczyk and Saucó Cano Navarro, Selective oxidation via photocatalysis for lignin valorisation in continuous flow microreactors, *2<sup>nd</sup> International Conference on the Sustainable Energy and Environmental Development (SEED)*, 14 – 17 Nov. 2017, Krakow, Poland.
- (2) **Vaishakh Nair** and R. Vinu. In-situ catalytic fast pyrolysis of lignin for the production of phenols using oxide catalysts, *249<sup>th</sup> ACS National Meeting*, 22-26 Mar. 2015, Denver, Colorado, USA.
- (1) **Vaishakh Nair** and R. Vinu. Novel chitosan-alkali lignin composites for adsorption of industrial effluents from waste water, *National Conference on Application of the Derivatives of Chitin and Chitosan (ADCC)-2014*, 22-23 Aug. 2014, The Gandhigram Rural Institute, Gandhigram, Tamil Nadu, India.

## Research Experience

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- ❖ **Nanomaterial synthesis and characterization** : synthesis of semiconductor oxide catalysts like TiO<sub>2</sub>, ZnO, CeO<sub>2</sub>, ZrO<sub>2</sub>, FeVO<sub>4</sub> using sol-gel, chemical precipitation and combustion method. The characterization studies of different nanosize catalyst were carried out using XRD, FT-IR, SEM-EDS
- ❖ **Development of biomaterial based composites** : synthesis of chitosan-lignin biocomposite for adsorption application, semiconductor-biochar based photocatalyst, acid modified biochar catalyst
- ❖ **Biomass valorization**: photocatalytic and thermocatalytic conversion of lignin and lignin model compounds to value added aromatic compounds, biodiesel production, selective photocatalytic oxidation of hydroxymethylfurfural to diformylfuran
- ❖ **Design and optimization of photoreactors** : development of fluoropolymer based photo-microreactors for chemical synthesis
- ❖ **Hands on experience of sophisticated instruments**: analysis of organic compounds, photocatalytic production of H<sub>2</sub> using GC-MS, GC-FID-TCD, HPLC-PDA
- ❖ **Hands on experience in professional Softwares**: Origin Pro, Microsoft, 123D Design, Design Expert
- ❖ **Guiding research scholars** : guiding and organising the work plan of Ph.D. students during postdoctoral research.
- ❖ **Other research activities** : experience in writing scientific articles for journals ranging from review articles to communication articles. Reviewed articles for reputed scientific journals.