

Curriculum Vitae

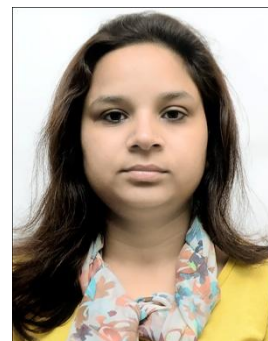
Dr. Alekha Tyagi

M.Sc (Chemistry), M.Tech & Ph.D. (Materials Science Programme)
Indian Institute of Technology (IIT), Kanpur (India)

Assistant Manager (R&D)
Balkrishna Industries Limited (BKT Tires), Gujarat (India)

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Current employment:

Assistant Manager (R&D) (June 2021-Present)
Balkrishna Industries Limited (BKT Tires), Bhuj, Gujarat (India)

Job responsibilities:

Research: Carbon nanomaterial synthesis and incorporation in rubber/tire composites to improve fuel (energy) efficiency, development of novel rubber-carbon filler mixing technologies, sustainable material incorporation in rubber formulation.

Management: Managing the chemical/analytical division of R&D unit (testing, data analysis, and reporting), new product development, new analytical method development and validation, process research and development, raw material quality control.

PhD research:

Synthesis and advanced structural and physicochemical characterization of non-precious metal-based and metal-free doped nanocarbon materials (reduced graphene oxide, CNT, and activated carbon), Material recycling focused on 'Waste to Wealth' for sustainable development, Structural engineering of nanomaterials with optimized surface morphology and chemistry for oxygen reduction reaction (cathode) catalysis for proton/anion exchange membrane fuel cell (P/AEMFC) and metal-air battery, Supercapacitor electrode materials, Fundamental electrochemistry and electrochemical characterization (cyclic voltammetry (CV), linear sweep voltammetry (LSV), chronoamperometry, galvanic charge discharge (GCD), and electro impedance spectroscopy (EIS)), energy device fabrication, evaluation and mitigation of degradation mechanisms.

Education:

• **Indian Institute of Technology (IIT) Kanpur, India – August, 2015-March, 2022**
Ph.D. Research Scholar (Materials Science Programme)

Thesis title: Precious metal-free cost-effective, efficient and durable electrocatalyst systems for oxygen reduction reaction

Thesis defended (March 2022)

CGPA- 8.97

• **Indian Institute of Technology (IIT) Kanpur, India**

M.Tech (Materials Science Programme)

Thesis title: Chicken feather rachis: A better precursor than feather fiber for activated carbon electrocatalyst for oxygen reduction reaction (ORR) in PEM fuel cell

Thesis defended (March 2019)

CGPA- 8.97

• **Department of Chemistry, Kurukshetra University, Kurukshetra, India – 2013-2015**

M.Sc Chemistry (Physical chemistry specialization)

Percentage- 79.65 %

• **Dyal Singh College, Karnal, India – 2010-2013**

B.Sc (Non-Medical)

Percentage- 81.76 %

• **Arya Girls Public School, Panipat, Haryana, India**

10+2 (Physics, Chemistry, Maths, English, Physical Edu.)

Percentage- 92.2 %

• **S.D.M. Sr. Sec. School, Panipat, Haryana, India**

10th (Science, Mathematics, Social studies, Hindi, English, Sanskrit)

Percentage- 95.4 %

Relevant courses:

MS601A: Structural & magnetic properties of materials

MS602A: Electrical and dielectric materials

MS605A: Materials engineering

MS603A: Mechanical properties of materials

MS604A: Characterization of materials

MSE694A: Nanostructures and nanomaterials: Characterization and properties

MSE642A: Microscopy and microanalysis of materials

Languages known: English, Hindi

Technical skills:

• Instrument operation, data analysis and interpretation in atomic force microscopy (AFM), X-ray diffraction (XRD), scanning electron microscope (SEM), thermogravimetry (TGA), differential scanning calorimetry (DSC), UV-visible and Fourier transform infrared (FT-IR) spectroscopy, Sorption isotherm study, high-performance liquid chromatography (HPLC), Gas chromatography- Mass spectrometry (GC-MS), solar simulator, etc.

- Data analysis and interpretation: Transmission electron microscopy, Raman spectroscopy, X-ray photoelectron (XPS) and X-ray fluorescence (XRF) spectroscopy
- Instrument operation, data analysis and interpretation: Electrochemical workstation – Metrohm Autolab multi-channel potentiostat/ galvanostat
Self-assembled RDE setup for electrochemical studies.
- Material synthesis techniques: High-temperature pyrolysis, Hydrothermal technique, Chemical vapor deposition (CVD), Co-precipitation method etc.
- MS Office (MS Word, Excel, Powerpoint), ORIGIN pro, XPSpeak 4.1 and different softwares used for various characterizations.
- Lab management and NABL scope awareness (ISO/IEC 17025 (2017))

Extra-curricular:

- National service scheme (NSS) volunteer 2012-2013

Achievements/Awards:

- 1st place in the ‘Science as art’ competition in MRS spring 2021 meeting & exhibit.
Title: Separated yet connected
- Best presentation award at International Conference on Soft Materials-2018 at MNIT, Jaipur, India
Title: Biowaste derived mesoporous activated carbon electrocatalyst for oxygen reduction reaction
- Received fellowship from Ministry of Human Resources and Development (MHRD) to pursue my doctoral study at Indian Institute of Technology Kanpur, India during the period 2015-2020.
- Qualified Graduate Aptitude Test in Engineering (GATE- Chemistry) in 2015; All India Rank 431.
- Qualified CSIR-NET (JRF) Examination Conducted by Council of Scientific & Industrial Research (CSIR), INDIA in June 2015; All India Rank 83.

Publications:

1) **Alekha Tyagi**, Amit Yadav, Prerna Sinha, Shashank Singh, Pradip Paik, and Kamal K. Kar
Chicken feather rachis: An improvement over feather fiber derived electrocatalyst for oxygen electroreduction.

Applied Surface Science 495 2019 143603-143617. (IF-6.707)

2) **Alekha Tyagi**, Kamal K. Kar and Hiroyuki Yokoi

Atomically dispersed Ni/NixSy anchored on doped mesoporous networked carbon framework: Boosting the ORR performance in alkaline and acidic media.

Journal of Colloid and Interface Science 571 2020 285-296. (IF-8.128)

3) **Alekha Tyagi**, Soma Banerjee, Shashank Singh, and Kamal K. Kar

Biowaste derived activated carbon electrocatalyst for oxygen reduction reaction: Effect of chemical activation.

International Journal of Hydrogen Energy 2020 45 16930-16943 (IF-5.816)

4) **Alekha Tyagi**, Yaswanth K. Penke, Prerna Sinha, Iram Malik, Kamal K. Kar, Janakarajan Ramkumar, and Hiroyuki Yokoi

ORR performance evaluation of Al-substituted MnFe_2O_4 / reduced graphene oxide nanocomposite

International Journal of Hydrogen Energy 2021 46 22434-22445 (IF-5.816)

5) **Alekha Tyagi**, Prerna Sinha, Kamal K. Kar, Hiroyuki Yokoi

Acid-directed preparation of micro/mesoporous heteroatom doped defective graphitic carbon as bifunctional electroactive material: Evaluation of trace metal impurity

Journal of Colloid and Interface Science 2021 604 227-238 (8.128)

6) **Alekha Tyagi** and Kamal K. Kar

Proliferation of pH-universal oxygen reduction performance by morphology modulation in NiS-N,S doped carbon microflowers

Materials Today Sustainability 2022 17 100093 (4.524)

7) Pankaj Chamoli, Tulika Srivastava, **Alekha Tyagi**, K.K. Raina, and Kamal K. Kar

Urea and cow urine-based green approach to fabricate graphene-based transparent conductive films with high conductivity and transparency.

Materials Chemistry and Physics 242 2020 122465. (IF-4.094)

8) Prerna Sinha, Amit Yadav, **Alekha Tyagi**, Pradip Paik, Hiroyuki Yokoi, Amit K. Naskar, Tapas Kuila, and Kamal K. Kar

Keratin-derived functional carbon with superior charge storage and transport for high performance supercapacitors

Carbon 168 2020 419-438. (IF-9.594)

9) Kiran Kumar Surthi, **Alekha Tyagi**, Kamal K Kar, and Ramkumar Janakarajan

First principle study on lithium-ion diffusion, electronic and electrochemical properties of cobalt doped lithium metal borates

Journal of Physics and Chemistry of Solids 148 2021 109779-109791 (IF- 3.995)

10) Daniel A. Fentahun, **Alekha Tyagi**, and Kamal K. Kar

Numerically investigating the AZO/Cu₂O heterojunction solar cell using ZnO/CdS buffer layer

Optik 228 2021 166228-166240 (IF- 2.443)

11) Yaswanth K Penke, Amit K Yadav, Iram Malik, **Alekha Tyagi**, Janakarajan Ramkumar, and Kamal K Kar

Insights of arsenic (III/V) adsorption and electrosorption mechanism onto multi synergistic (redox-photoelectrochemical-ROS) aluminum substituted copper ferrite impregnated rGO

Chemosphere 267 2021 129246-129257 (IF- 7.086)

12) Daniel A Fentahun, **Alekha Tyagi**, Sugandha Singh, Prerna Sinha, Amodini Mishra, Somnath Danayak, Rajesh Kumar, and Kamal K Kar

Tunable optical and electrical properties of p-type Cu₂O thin films

Journal of Materials Science: Materials in Electronics 2021 1-15 (IF- 2.478)

Patents:

1) Indian patent (Granted): Kamal Krishna Kar, Janakarajan Ramkumar, Yaswanth Kumar Penke, Amit Kumar Yadav, Iram Malik, **Alekha Tyagi**

Mn-Al-Fe Impregnated RGO hybrid composite for arsenic adsorption and its sludge as supercapacitor (2019)

Application no.: 201911002684

2) Indian patent (Published): Kamal Krishna Kar, **Alekha Tyagi**, Sri Niwas Singh

Catalyst for oxygen reduction reaction for fuel cells and method of manufacturing same (2021)

Application no.: 202111013177

Book chapters:

1) **Alekha Tyagi**, Soma Banerjee, Jayesh Cherusseri, Kamal K. Kar

Book Title: Handbook of Nanocomposite Supercapacitor Materials I, Chapter title:

Characteristics of transition metal oxides, Edition Number: 1, Year:2020, Series Volume: 300, Pages: 91-123 Springer International Publishing.

2) Bibekananda De, Soma Banerjee, Tanvi Pal, **Alekha Tyagi**, Kapil D Verma, P K Manna, Kamal K Kar

Book Title: Handbook of Nanocomposite Supercapacitor Materials II, Chapter title: Transition Metal Oxide/Carbon Nanotube Composites as Electrode Materials for Supercapacitors, Edition Number: 2, Year:2020, Series Volume: 302, Pages: 245-270 Springer International Publishing.

3) Bibekananda De, Prerna Sinha, Soma Banerjee, Tanvi Pal, Kapil D Verma, **Alekha Tyagi**, P K Manna, Kamal K Kar

Book Title: Handbook of Nanocomposite Supercapacitor Materials II, Chapter title: Transition metal oxide/graphene/reduced graphene oxide composites as electrode materials for supercapacitors, Edition Number: 2, Year:2020, Series Volume: 302, Pages: 297-331 Springer International Publishing.

4) Bibekananda De, Soma Banerjee, Tanvi Pal, Kapil D Verma, **Alekha Tyagi**, P K Manna, Kamal K Kar

Book Title: Handbook of Nanocomposite Supercapacitor Materials II, Chapter title: Transition Metal Oxide/Electronically Conducting Polymer Composites as Electrode Materials for Supercapacitors, Edition Number: 2, Year:2020, Series Volume: 302, Pages: 353-385 Springer International Publishing.

5) Bibekananda De, Soma Banerjee, Tanvi Pal, Kapil D Verma, **Alekha Tyagi**, P K Manna, Kamal K Kar

Book Title: Handbook of Nanocomposite Supercapacitor Materials II, Chapter title: Transition Metal Oxide-/Carbon-/Electronically Conducting Polymer Based Ternary Composites as Electrode Materials for Supercapacitors, Edition Number: 2, Year:2020, Series Volume: 302, Pages: 387-434 Springer International Publishing.

Conference Proceedings/Oral & Poster presentations:

1) Oral presentation: Biowaste derived H_3PO_4 activated carbon electrocatalyst for oxygen reduction reaction in polymer electrolyte membrane fuel cell

International Conference on Advancements in Polymeric Materials-2018

CIPET Bhubaneswar, India.

2) Oral presentation: Biowaste derived mesoporous ZnCl_2 activated carbon electrocatalyst for oxygen reduction reaction

International Conference on Soft Materials-2018

MNIT Jaipur, India.

Award: **Best presentation award**

3) Poster presentation: Oxygen reduction catalyst derived from chicken feather rachis using lowtemperature pyrolysis and KOH activation.

International conference on Nanotechnology for Better living-2019

IIT Kanpur, India.

4) Poster presentation: Poultry biowaste derived improved electrocatalyst for oxygen reduction in PEM fuel cells: Waste to wealth

International conference on Advanced Nanomaterials and Nanotechnology-2019

IIT Guwahati, India

5) Virtual presentation: MnFe_2O_4 impregnated on reduced graphene oxide (RGO) for electrocatalysis of oxygen reduction reaction

International Conference on Soft Materials-2020

Malviya National Institute of Technology (MNIT) Jaipur, India

6) Virtual presentation: Single Ni atom decorated networked carbon for pH-universal oxygen electroreduction

MRS 2021Spring meeting & exhibit-2021

Award: 1st place in **Science as Art** competition

Reference:

Dr. Kamal K. Kar

Professor (PhD thesis supervisor)

Department of Mechanical Engineering and Materials Science Programme

Indian Institute of Technology Kanpur, India

Email id- kamalkk@iitk.ac.in

Dr. Raghunandan Sharma

Assistant Professor

SDU Chemical Engineering, Department of Green Technology (IGT)

University of Southern Denmark

Odense-Denmark

Email id: rash@igt.sdu.dk