Curriculum Vitae

Personal Information

Name:	**Dr. Pradip Kumar (Ph.D.)**
Gender:	Male, Married
Date of Birth:	15th July, 1984
Nationality:	Indian

Current Affiliation; **DST Inspire Faculty**
Department of Physics, Central University of Rajasthan
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Educational Qualifications

Ph.D. (2012) in **Physics** from School of Physical Sciences, **Jawaharlal Nehru University (JNU)**, New Delhi, INDIA

Thesis Title: ***Solvent Dependent Dispersion and Spectroscopic Study of Carbon Nanoparticles***
Advisor: Professor **Himadri B Bohidar**

M.Sc. (2005) in Physics, M. J. P. Rohilkhand University, Bareilly, Uttar Pradesh, India (1st division)

B.Sc. (2003) in Physics, Mathematics & Chemistry, M. J. P. Rohilkhand University, Bareilly, Uttar Pradesh, India (1st division)

12th (2000) in Physics, Mathematics, Chemistry, English & Hindi, U.P. Board Allahabad, Uttar Pradesh (1st division).

Research Experience

- Presently DST Inspire Faculty at Department of Physics, Central University of Rajasthan, Ajmer (May 2018 - continue)
- DST Inspire Faculty, Chemistry Division, Bhabha Atomic Research Centre (BARC), Mumbai, India (May 2016 – May 2018)
- Visiting scientist at Materials Architecturing Research Center, Korea Institute of Science and Technology (KIST), Seoul, South Korea (March 2014 – May 2016)
- IBS Postdoctoral Fellow at Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), South Korea (March 2013 – February 2014)
- Brain Korea 21, Postdoctoral Fellow at Department of Chemical and Biomolecular Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea (July 2012 – February 2013)

Current Area of Research Interests

My current research is focused on applied aspects of synthesis, characterizations and applications of inorganic nanostructures and composites. Specific aspects include;

- Synthesis of graphene, polymer composites and other 2D layered materials.
- Phase behaviour, rheology and processing of graphene oxide liquid crystals into polymers.
- Graphene-based materials; thin films, foams, aerogels and polymer composites for thermal management and electromagnetic interference (EMI) shielding applications.
- Graphene based materials for energy storage applications.

Awards/Recognitions/Achievements

- **DST Inspire Faculty** award [DST/INSPIRE/04/2015/002415] February 2016
- Life time member of **Indian Thermal Analysis Society (ITAS)** and **Society for Material Chemistry (SMC)** India
- PhD Thesis is published as a book by Lambert Academic Publishing, Germany, ISBN: 978-3-8473-7944-7
- **Best Young Scientists Award** in "National Symposium on Nanoscience: Theory and Applications", 5-7th November, 2009, School of Environmental Sciences, Jawaharlal Nehru University, India
- Graduate Aptitude Test in Engineering **(GATE)** in Physical Sciences (2007)
- **Distinction** in Mathematics in 12th Class (U. P. Board Allahabad)
- **Other activities:** Potential reviewer for International journals **–** *Journal of Physical Chemistry, ACS Applied Materials & Interfaces, Carbon, Applied Physics Letter, and so on.*

Invited talks

- Invited talk on *Recent Advances in Graphene-based materials for electromagnetic interference shielding and thermal management applications*, "RATEP-2018, 17-18th April 2018", Department of Physics and Astronomical Sciences, Central University of Jammu, Jammu & Kashmir, India.
- Invited talk on *Graphene-based materials for multifunctional applications*, "ICN: 3I 2017", 6-8th December, IIT Roorkee, India.
- Invited talk on *Highly aligned and conducting composite thin film for efficient electromagnetic interference* shielding, "International Conference on Thin Films (ICTF-17)", 13-17th November 2017, NPL Delhi.
- Invited talk on *Graphene-based materials for high-performance electromagnetic interference shielding*, "6th International conference on Functional Electroceramics and Polymers (ICEP-2017)", 20-22th February 2017, IIT Kharagpur, India
- Invited talk on *Ultrahigh electrical and thermally conductive self-aligned graphene/polymer composite;* Pradip Kumar, "2nd Annual World Congress of Smart Materials- 2016 (WCSM-2016)", 4-6th March 2016, Singapore.
- Invited talk at NTT Basic Research Laboratories, Tokyo, Japan on 19th March, 2012.

Conferences/Workshops

- Attended DAE-BRNS first workshop on thermal analysis "THERMAWORK-2016", 20-21st December 2016, BARC, Mumbai.
- Poster Presentation on *A flexible hybrid graphene/silver nanowires composite thin film for high-performance electromagnetic interference shielding*; **Pradip Kumar**, "6th DAE-BRNS Interdisciplinary Symposium on Material Chemistry (ISMC-2016)", 6-10th December 2016, BARC, Mumbai.
- Poster Presentation on *Ultrahigh electrical and thermally conductive self-aligned graphene/polymer composite using large area graphene oxide;* **Pradip Kumar**, Faisal Shahzad, Taehoon Kim, Seunggun Yu, Soon Man Hong and Chong Min Koo, "Korean Polymer Society", 6-8th October 2015, Daegu, Korea.
- Poster Presentation on *Fabrication of aligned and conductive reduced graphene oxide/polymer nanocomposites thin film for electromagnetic interference shielding;* **Pradip Kumar**, Faisal Shahzad, Seunggun Yu, Soon Man Hong and Chong Min Koo, "Korean Polymer Society", 8-10th April 2015, DCC, Daejeon, Korea.
- Attended 1st IBS Research Conference, 27-28th November 2013, Daejeon Convention Centre, Korea.
- Poster Presentation on *Viscoelasticity of graphene oxide liquid crystals;* **Pradip Kumar** and Sang Ouk Kim, "4th A3 Symposium on Emerging Materials: Nanomaterials for Energy", 10-14th November 2013, Daemyung Resort Jeju Island, Korea.
- Attended a Workshop on '*Electron microscopy and its applications'*, 28-29th February, 2012 at Advanced Instruments Research Facility (AIRF), Jawaharlal Nehru University, New Delhi, India.
- Poster Presentation on *Non-functionalized carbon nanoparticles: spectroscopic study;* **Pradip Kumar** and H B Bohidar, "National fluorescence workshop (FCS-2011) on Spectroscopy and Microscopy in Biology and Chemistry"**,** 14-18th November 2011, Jawaharlal Nehru University, New Delhi, India.
- Poster Presentation on *Relaxation dynamics in carbon nanoparticles-polymer nanocomposites*; **Pradip Kumar** and H B Bohidar, "Winter School on Chemistry and Physics of Materials" at International Centre for Material Science (ICMS)", 6-10th December 2010, JNCASR, Bangalore, India.
- Poster Presentation on *Substrate effect on the morphology of multi-carbon nanoparticles*; **Pradip Kumar** and H B Bohidar "International Conference on Advanced Nanomaterials and Nanotechnology (ICANN-2009)" 9-11th December 2009, Indian Institute of Technology, Guwahati, India.
- Poster Presentation (Best Young Scientists Award) on *Self-Aggregation of carbon nanoparticles in polar, nonpolar and binary solvents*; **Pradip Kumar** and H B Bohidar, "National Symposium on Nanoscience: Theory and Applications", 5-7th November 2009, School of Environmental Sciences, Jawaharlal Nehru University, India.
- Oral talk on *Interaction of multi carbon nanoparticles with various surfactants*; **Pradip Kumar** and H B Bohidar, "National Conference on Surfactants, Emulsions and Biocolloids (NATCOSEB-XIV)", 28-30th July 2009 Department of Chemistry, University of Kashmir, India.
- Attended a Workshop on Laser Spectroscopy and Nanophotonics, 14-15th march 2008, Indian Institute of Technology, Delhi, India.

List of Publications [Total citations = 506, *h*-index = 14]

[Google Scholar: https://scholar.google.co.in/citations?user=gbmTNPcAAAAJ&hl=en]

28. Recent Advances in Polymer-based Materials for Electromagnetic Interference Shielding: Review and Future Prospects; **Pradip Kumar**, Uday Narayan Maiti, Anirban Sikdar, Tapas Kumar Das, Asheesh Kumar, V Sudarsan (Under Review in **Current Opinion in Solid State & Material Science,** Impact Factor = 6.54].

27. Mössbauer spectroscopic study of cobalt hexacyanoferrate nanoparticles: Effect of hydrogenation; A Kumar, AB Kanagare, S S Meena, S Banerjee, **Pradip Kumar**, V Sudarsan **AIP Conference Proceedings**, 1942 (2018), 140045.

26. Synthesis of cobalt hexacyanoferrate nanoparticles and its hydrogen storage properties; A Kumar, AB Kanagare, S Banerjee, **Pradip Kumar**, M Kumar, V Sudarsan, **International Journal of Hydrogen Energy**, 43 (2018), 7998-8006 [Impact Factor = 4.23].

25. An asymmetric electrically conducting self-aligned graphene/polymer composite thin film for efficient electromagnetic interference shielding; **Pradip Kumar**, Asheesh Kumar, Kie Yong Cho, Tapas Kumar Das and V Sudarsan, **AIP Advances,** 7 (2017) 015103 [Impact Factor = 1.65].

24. Molybdenum-doped PdPt@Pt Core-shell octahedra supported by ionic block copolymer-functionalized graphene as a highly active and durable oxygen reduction electrocatalyst; Kie Yong Cho, Yong Sik Yeom, Heun Young Seo, **Pradip Kumar**, Albert S. Lee, Kyung-Youl Baek, and Ho Gyu Yoon, **ACS Applied Materials & Interfaces**, 9 (2017) 1524-1535 [Impact Factor = 8.09].

23. A facile synthetic route for highly durable mesoporous platinum thin film elecrocatalysts based on graphene: morphology and support effects on oxygen reduction reaction; Kie Yong Cho, Yong Sik Yeom, Heun Young Seo, **Pradip Kumar**, Kyung-Youl Baek and Ho Gyu Yoon, **Journal of Material Chemistry A,** 5 (2017) 3129-3135 (Featured as Inside front cover page) [Impact Factor = 9.93].

22. A flexible sandwich graphene/silver nanowires/graphene thin film for high-performance electromagnetic interference shielding; **Pradip Kumar**, Faisal Shahzad, Soon Man Hong and Chong Min Koo, **RSC Advances,** 6 (2016) 101283-101287 [Impact Factor = 2.93].

21. Stable 2D-structured supports incorporating ionic block copolymer-wrapped carbon nanotubes with graphene oxide toward compact decoration of metal nanoparticles and high-performance nano-catalysis; Kie Yong Cho, Heun Young Seo, Yong Sik Yeom, **Pradip Kumar**, Albert Lee, Kyung-Youl Baek, and Ho Gyu Yoon, **Carbon,** 105 (2016) 340-352 [Impact Factor = 7.08].

20. Biomass-derived thermally annealed interconnected sulfur-doped graphene as a shield against electromagnetic interference; Faisal Shahzad, **Pradip Kumar**, Yoon-Hyun Kim, Soon Man Hong, and Chong Min Koo, **ACS Applied Materials & Interfaces,** 8 (2016) 9361-9369 [Impact Factor = 8.09].

19. Microwave-assisted synthesis of voids induced graphene-wrapped nickel-oxide hybrids for supercapacitor application; Rajesh Kumar, R K Singh, Raluca Savu, Pawan Kumar Dubey, **Pradip Kumar** and S A Moshkalev, **RSC Advances,** 6 (2016) 26612-26620 [Impact Factor = 2.93].

18. Ultrahigh electrical and thermally conductive self-aligned graphene/polymer composite using large-area graphene oxide; **Pradip Kumar,** Seunggun Yu, Faisal Shahzad, Soon Man Hong, Yoon-Hyun Kim and Chong Min Koo, **Carbon,** 101 (2016) 120-128 [Impact Factor = 7.08].

17. Ionic block copolymer doped reduced graphene oxide supports with ultra-fine Pd nanoparticles: Strategic realization of ultra-accelerated nanocatalysis; Kie Yong Cho, Yong Sik Yeom, Heun Young Seo, **Pradip Kumar**, Albert Lee, Kyung-Youl Baek and Ho Gyu Yoon, **Journal of Material Chemistry A,** 3 (2015) 20471-20476 (Featured as back cover page) [Impact Factor = 9.93].

16. Sulfer-doped graphene laminates for high performance EMI shielding; Faisal Shahzad, **Pradip Kumar**, Seunggun Yu, Soon Man Hong, Yoon-Hyun Kim and Chong Min Koo, **Journal of Material Chemistry C**, 3 (2015) 9802-9810 (Featured as back cover page) [Impact Factor = 5.97].

15. Sulfur-doped reduced graphene oxide/polystyrene composites for high performance EMI shielding; Faisal Shahzad, Seunggun Yu, **Pradip Kumar**, Jang-Woo Lee, Soon Man Hong, Yoon-Hyun Kim and Chong Min Koo, **Composite Structures,** 133 (2015) 1267-1275 [Impact Factor = 4.10].

14. Large-area reduced graphene oxide thin film with excellent thermal conductivity and electromagnetic interference shielding effectiveness; **Pradip Kumar**, Faisal Shahzad, Seunggun Yu, Soon Man Hong, Yoon-Hyun Kim and Chong Min Koo, **Carbon,** 94 (2015) 494-500 [Impact Factor = 7.08].

13. Surface energy-driven growth of crystalline PbS octahedra and dendrites in the presence of cyclodextrin-surfactant supramolecular complexes; **Pradip Kumar**, Whi Dong Kim, Seokwon Lee, Dennis T Lee, Kangtaek Lee and Doh Chang Lee, **Journal of Nanoparticle Research**, 17 (2015) 108 (11 pages) [Impact Factor = 2.12].

12. Non-functionalized fluorescent carbon nanoparticles: In Vitro imaging and organic solvent sensing applications; **Pradip Kumar**, H B Bohidar and Rajesh Kumar, **Science of Advanced Materials,** 7 (2015) 706-713 [Impact Factor = 1.31].

11. Rheological properties of graphene oxide liquid crystal; **Pradip Kumar**, U N Maiti, K E Lee and Sang Ouk Kim, **Carbon,** 80 (2014) 453-461[Impact Factor = 7.08].

10. Clean and efficient synthesis of graphene nanosheets and rectangular aligned-carbon nanotubes bundles using green botanical hydrocarbon precursor: Sesame oil; Rajesh Kumar, Rajesh Kumar Singh, **Pradip Kumar**, R.S. Tiwari and O.N. Srivastava, **Science of Advanced Materials,** 6 (1) (2014) 76-83 [Impact Factor = 1.31].

9. Pressure dependent synthesis of high quality few layer graphene by plasma-enhanced arc discharge and their thermal stability; Rajesh Kumar, Rajesh Kumar Singh, Pawan Kumar Dubey, **Pradip Kumar,** R S Tiwari and Oh Ilkwon, **Journal of Nanoparticle Research,** 15 (2013) 1847 (10 pages) [Impact Factor = 2.12].

8. Observation of fluorescence from non-functionalized carbon nanoparticles and its solvent dependent spectroscopy**; Pradip Kumar** and H B Bohidar, **Journal of Luminescence,** 141 (2013) 155-161 [Impact Factor = 2.73].

7. Physical and fluorescent characteristics of non-functionalized carbon nanoparticles from candle soot; **Pradip Kumar** and H B Bohidar, **Journal of Nanoparticle Research,** 14 (2012) 948 (10 pages) [Impact Factor = 2.12].

6. Universal correlation between solvents polarity, fluorescence lifetime and macroscopic viscosity of alcohol solutions; **Pradip Kumar** and H B Bohidar, **Journal of Fluorescence,** 22 (2012) 865-870 [Impact Factor = 1.66].

5. Fluorescence behavior of non-functionalized carbon nanoparticles and their in vitro applications in imaging and cytotoxicity study of cancer cells; **Pradip Kumar**, R. Meena, R. Paulraj, A. Chanchal, A K Verma and H B Bohidar, **Colloids and Surface B: Biointerfaces**, 91 (2012) 34-40 [Impact Factor = 3.99].

4. Hydration of gelatin molecules in glycerol-water solvent and phase diagram of gelatin organogels; Shilpa Sanwalani, **Pradip Kumar** and H B Bohidar, **Journal of Physical Chemistry B,** 115 (2011) 7332-7340 [Impact Factor = 3.14].

3. Interaction of soot derived multi carbon nanoparticles with lung surfactants and their possible internalization inside alveolar cavity; **Pradip Kumar** and H B Bohidar, **Indian Journal of Experimental Biology,** 48 (2010) 1037-1042 [Impact Factor = 1.47].

2. Aqueous dispersion stability of multi-carbon nanoparticles in anionic, cationic, non-ionic, bile Salts and pulmonary surfactant solutions; **Pradip Kumar** and H B Bohidar, **Colloids and Surface A: Physiochemical Engineering Aspects,** 361 (2010) 13-24 [Impact Factor = 2.82].

1. Anomalous self-aggregation of carbon nanoparticles in polar, nonpolar, and binary solvents; **Pradip Kumar**, Somnath Karmakar and H B Bohidar, **Journal of Physical Chemistry C,** 112 (2008) 15113-15121 [Impact Factor = 4.48].

Patents;

Non-functionalized Carbon Nanoparticles having Fluorescence Characteristics, Method of Preparation Thereof, and their Use as Bioimaging and Solvent Sensing Agents; H B Bohidar and Pradip Kumar, International Publication Number: WO 2012/035545 A2.

Books/Chapters;

- **Pradip Kumar**; book chapter "Synthesis routes for carbon based materials" contribution in *Synthesis Strategies for Advanced Materials*, Wiley (To be published soon).

- Chong Min Koo, Faisal Shahzad, **Pradip Kumar**, Seunggun Yu, Seung Hwan Lee, Jun Pyo Hong; book chapter "Polymer-based EMI shielding materials" contribution in *Advanced Materials for EMI Shielding*, John Wiley & Sons, 2018, (ISBN: 978-1-1191-2861-8).

- **Pradip Kumar** and H B Bohidar; Ph.D Thesis work was published as book entitled *Dispersion and Spectroscopic Study of Carbon Nanoparticles* in LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany, 2012 (ISBN: 978-3-8473-7944-7).

Declaration: I hereby declared that all the statement made in this CV are true, complete and correct to the best of my knowledge and belief.

Dr Pradip KUMAR
27th July 2018, CURaj, Ajmer

Brief Summary of Current Research

Along with the recent enormous interest in carbon materials, carbon-based liquid crystals hold great promise for high-performance carbon material synthesis or device operation. Graphene oxide consists of water-dispersible, soft carbon sheets that can be easily converted to a conductive form; this 2D material should continue to inspire many curiosity-driven discoveries and applications in a wide variety of fields including liquid-crystal display technology, materials science, and bioscience. While there has been a world-wide surge in realizing applications, there is little understanding of the flow and phase behaviour of the graphene nanoplatelets in suspension. Such an understanding would open the door to a wide range of applications in advanced electronics, optoelectronics. Since, Graphene Oxide has an extremely high aspect ratio, it should be able to form a Liquid Crystalline phase. The liquid crystallinity of graphene oxide offers a versatile route to control the molecular organization and the corresponding properties of the carbon-based materials. Therefore it is of both practical and fundamental importance to characterize and understand the phase behaviour of Graphene Oxide suspension.

We have reported the aqueous GO dispersion exhibit the well-defined LC phases and gel-like behaviour based on rheological measurements [**Carbon, 2014**]. The GO dispersion exhibits shear thinning behaviour, which is well described by power law and Carreau models. Viscoelastic measurements revealed that liquid crystals and gel-like phase exhibit well- defined elastic shear modulus and yield stress, which increase with GO composition following a power law. Our observations of strongly nonlinear rheology under flow demonstrate that precise rheological characterization of GO liquid crystalline dispersion is required for their processing into desired structures and properties. This study of phase behaviour and molecular orientation, will be helpful for their processing for a wide range of applications in advanced electronics, optoelectronics.

Due to rapid growth in high power electronics and portable devices, thermal management became a crucial issue for progress in information, communication and energy storage technologies. Efficient heat removal is a critical issue for the performance and reliability of modern electronic, optoelectronic, photonic devices and systems. In addition to heat emission, electronic components also create undesirable electromagnetic energy which compromises their performance and life time and interfere with function of nearby electronic components and devices. Moreover, rapid growth in information technology and fast-growing market of Wi-Fi portable devices makes the space overcrowded, which creates chaos sometimes among different communication channels. To overcome the problems of heat dissipation and undesirable electromagnetic interference (EMI), materials with the combination of high thermal conductivity (TC), high electrical conductivity and excellent EMI shielding efficiency. Carbon based materials including carbon nanotubes (CNTs), carbon fibers, carbon filaments, and chemically derived graphene have been widely used as conductive fillers for fabrication of composite material for EMI shielding application due to their remarkable physical and chemical properties. Graphene, a two-dimensional (2D) carbon material, have extensive research interests due to its very high electrical conductivity, extremely high thermal conductivity, superior mechanical stiffness, light weight, and large aspect ratio, which make it an excellent choice for high-performance EMI shielding material. Graphene and graphene based composite thin film may provide a high performance thermally conductive shielding material with high mechanical flexibility.

We have been contributing new technologies in the field of thermally conductive interface materials, electromagnetic interference shielding materials and so on. For the first time, we have demonstrated an

innovative chemically reduced large area graphene oxide thin film with excellent features of good mechanical stiffness, electrical conductivity, ultrahigh thermal conductivity, and high EMI shielding effectiveness [**Carbon 2015**]. The excellent thermal conductivity ~1350 W/mK obtained from large area reduced rLGO film is the highest ever reported from any reduced graphene oxide thin film. More importantly, its EMI shielding effectiveness can reach up to ~ 20 dB, which is the required value for commercial application. This much improved performance of rLGO is attributed to the fact that the larger area LGO sheets include much fewer defects that are mostly caused by the damage of graphene sp^2 structure around edge boundaries, resulting in large electrical conductivity. The performance of graphene film was further improved by hybrid graphene/AgNWs thin film. The rGO/AgNWs/rGO thin film exhibited not only an excellent electrical conductivity of 64500 S/m but also a larger EMI shielding value of ~38 dB at 35 wt% AgNW content. This enhancement in electrical conductivity and EMI shielding is mainly attributed to the tight adhesion of the top and bottom graphene layers with the middle AgNW layer. In the sandwich hybrid films, the graphene layers not only provide extra pathways for electron transfer, but also block the contact between the AgNWs and oxygen, leading to a better resistance to oxidation, good electrical conductivity, and excellent mechanical flexibility.

Further, aligned conducting nanofillers in polymer matrix are expected to enhance the thermal and electrical conductivity of the composite due to lower resistance along the aligned direction. First time, we have fabricated composite film by simple solution casting of graphene oxide/PVDF-HFP dispersion on Teflon Petri dish, followed by HI reduction [**Carbon, 2016**]. The resulting highly aligned and free-standing composite film exhibited ultrahigh electrical conductivity of ~ 3000 S/m and exceptional in-plane thermal conductivity of ~ 19.5 W/mK. At Higher graphene content, composite film was found to be asymmetric. Both sides of as prepared composite film showed different surface characteristics. The asymmetric surface properties of composite film induced distinction of surface resistivity response; top surface resistivity (21 Ohm) is ~ 4 times higher than bottom surface resistivity (5 Ohm). This asymmetric highly electrically conducting composite film revealed efficient electromagnetic interference (EMI) shielding effectiveness of ~30 dB. This ultrahigh electrical and thermal conductivity of self-aligned composite thin films were attributed to the good interfacial interaction, effective chemical reduction, high aspect ratio, and preferential orientation of graphene sheets along the film direction. Our findings would be tremendously important in portable electronic devices, automobiles, and also in thermally conducting materials and EMI shielding application.

In addition to pristine graphene and its composite thin films, for the first time we demonstrated that a laminated structure of sulfur-doped reduced graphene oxide (SrGO) provides significant potential for electromagnetic interference shielding applications. We prepared SrGO through the reaction between graphene oxide and hydrogen disulfide (H_2S) gas at elevated temperatures. The doping degree of S was controlled through varying the time and temperature of the reaction and the maximum doping content of 5.6 wt% was achieved. Because of the n-type doping contribution of the S atom to the doped graphene, SrGO laminate not only revealed a 47% larger electrical conductivity (75 S/cm) than undoped reduced graphene oxide laminate (51 S/cm) but also revealed 119% larger EMI shielding effectiveness (33.2 dB) than the undoped one (15.5 dB) at the same sample thickness [**Journal of Material Chemistry C 2015, Featured as back cover].** We also developed a sulfur-doped reduced graphene oxide (SrGO) with high electrical conductivity through using a novel biomass, mushroom-based sulfur compound (lenthionine) via a two step thermal treatment. The resultant SrGO product exhibited excellent electrical conductivity an excellent EMI shielding effectiveness of 38.6 dB, which is 61% larger than 24.4 dB measured for undoped rGO **[ACS Applied Materials & Interface 2016**].

We have also synthesized an ultra-fine Pd nanocatalyst supported by ionic block copolymer doped reduced graphene oxide (Pd-PIBrGO) for ultra-accelerated nanocatalysis. This hybrid catalyst exhibited exceptionally advanced catalytic performance for the reduction of methylene blue using miniscule quantities of Pd-PIBrGO due to facilitated diffusion of reagents, resulting in full reduction within a few seconds and showing a 280-fold increase of the rate constant over Pd-rGO without ionic block copolymers [**Journal of Material Chemistry A 2015, Featured as back cover].** We have also developed highly active and durable molybdenum-doped PdPt@Pt core-shell octahedra supported by ionic block copolymer-functionalized graphene electrocatalysts (Mo-PdPt@Pt/IG) for oxygen reduction reaction (ORR) [**ACS Applied Materials & Interfaces 2017**]. We also reported a facile route for the synthesis of uniform, large-area mesoporous platinum thin films based on ionic polymer doped graphene, which exhibit substantially enhanced activity and durability for oxygen reduction relative to commercial Pt/C. Notably, the remarkable durability (95% retention of electrochemical activities after 30,000 cycles of intensive accelerated durability tests) is acquired that is ascribed to the synergetic effects derived from the interconnected Pt structure (morphology) and ionic polymer-doped graphene (support). The suggested robust concept for the controlled mesoporous-structured platinum thin film on graphene could be a great breakthrough for a highly durable electrocatalyst [**Journal of Material Chemistry A 2017, Featured as Inside front cover**].

The development of new graphene-based composites for thermal conducting interface materials and lightweight EMI shielding materials is an interesting challenge for current electronics and electronic devices and systems. So, this work needs to be extended for long-term research. My work will not be limited to EMI shielding and heat management application but also extending for other potential applications such as energy, scaffolds, sensors, actuators, catalytic support, and environmental devices and so on for long-term research dream.