

Dr. Yugal Kishor Mahipal (Assistant Professor)

(FORMER ICTP-TRIL /Postdoctoral Fellow Italy / Malaysia)

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Personal Profile

- **Date of Birth** : March 15, 1981
- **Sex** : Male
- **Nationality** : Indian
- **Religion** : Hindu
- **Marital Status** : Married
- **Father's Name** : Mr. Sheoraj Singh Mahipal
- **Residential Address** : G – 6, New Building, Teacher Colony,
Pt. Ravishankar Shukla University Campus,
Raipur – 492010, Chhattisgarh, India
- Passport Number** : **H-2646239** (Place of Issue: RAIPUR; Date of Issue: 15//04/2009;
Date of Expiry: 14/04/2019)
S 9421196 (Place of Issue: RAIPUR; Date of Issue: 25//04/2019;
Date of Expiry: 24/04/2029)

Teaching Experience : 07 Years

Educational Qualifications

Ph. D. awarded (Physics, Dec. 26, 2011) Pt. Ravishankar Shukla University, Raipur,

Specialization: Materials Science/Solid State Physics

Thesis Title: “Investigations on Electroactive Polymer Electrolytes: Synthesis, Characterization and Electrochemical Battery Applications”.

- **M. Sc. (Physics), 2005**, School of Studies in Physics, Pt. Ravishankar Shukla University, Raipur,
- **Specialization:** Solid State Physics.
- **B. Sc., 2003**, (Subjects: Physics, Chemistry, Mathematics), Pt. Ravishankar Shukla University, Raipur,
- **Higher Secondary, 1999**, Shri L. N. Vidyapeeth Hr. Sec. School Durg,

- **High School, 1997**, Govt. Hr. Sec. School, Gandai, Dist -Rajnandgaon,

Fellowships Awarded

- **Senior Research Fellowship (SRF)** by University Grants Commission (UGC) **New Delhi, India (Host Institute:** Pt. Ravishankar Shukla University, Raipur, C.G., India; From 11 Sept.2009 – December 2011).
- **Junior Research Fellowship (JRF)** by University Grants Commission (UGC) **New Delhi, India (Host Institute:** Pt. Ravishankar Shukla University, Raipur, C.G., India (11 Sept. 2007 – 10 Sept. 2009).
- **TWAS – Post doctoral Fellowship Position – 2012.**
- **Awards/Nomination**
 - **6th Chhattisgarh Young Scientist (Physics & Electronic Section), 6th Chhattisgarh Young Science**
Congress by Chhattisgarh Council of Science & Technology (CCOST), Raipur, Feb. 28-29, 2008.
 - **Student Attendee Award by Electrochemical Society, New York, USA** during 18th Int. Conf. on Solid State Ionics (SSI-18), Warsaw, Poland, July 3-8, 2011

Membership of Learned Societies

- Life member, **Indian Solid State Ionics Society** (2017)
- Annual member, **Indian Science Congress Association** (2007 and 2008-09)

Academic Abroad visits

- **Canada: Toronto** to participate in the ‘17th Int. Conf. on Solid State Ionics (SSI-17) during June 28-July 4, 2009.
- **Italy: Padova** to participate in the ‘12th International Symposium on Polymer Electrolytes (ISPE-12)’, 29 August - 3 September 2010.
- **Poland: Warsaw** to participate in the 18th Int. Conf. on Solid State Ionics (SSI-17) during July 3-8, 2011.
- **Rome, Italy under ICTP-TRIL Fellowship, 2012**
- **Kuala Lumpur, Malaysia for Post – Doctoral Fellowship, 2014-15.**

Teaching Subject: Classical Mechanics, Statistical Mechanics and Physics of Nano Materials.

Principal Investigators For Research Projects:

1. Effect of High-Energy Ball-Milling and Study of Nano-ionic Effect in Dry Polymer Electrolytes **financial support through a Mini Research Project (MRP): No. 15039/CCOST/MRP/13, date: 29/03/14 [Co – PI].**
2. UGC BSR Start – up Research Grant entitled “**Electro-active Polymer Electrolytes: Synthesis, Characterization and Electrochemical Device Prospects**” No. F. 30 – 435/2018 (BSR) dt. June 7, 2018. [**Status: Ongoing, As PI**].

Research Area/Interest

Energy Materials and Electrochemical Power Sources (Experience: 7 years)

- Solid State Electrolyte Materials.
- Synthesis of Electrode Materials for device fabrication.
- Ionic liquid based gel polymer electrolytes (new generation materials for energy conversion and storage) for batteries and supercapacitors applications.
- Nanostructured conducting polymers (Polyaniline, polypyrrole, polythiophene and their derivatives etc.) and their oxide and carbon composites for supercapacitor applications.
- Ag⁺-ion conducting based Superionic System.

Characterization Techniques (Materials & Devices)

- Ionic conductivity and Interfacial Polarization Resistance by Impedance Spectroscopy (IS).
- Structural properties by FT-IR.
- Thermal properties by DSC.
- Microstructure by SEM, AFM.
- Various electrochemical characterizations viz. cyclic voltammetry, linear sweep cyclic voltammetry etc. using Electrochemical Analyzer (using CH Instruments, USA)
- Fabrication & characterization of Electrochemical Devices viz. rechargeable batteries, supercapacitors by charge-discharge characteristics (using Arbin Instruments, USA)
- High Energy Planetary Ball Mill.

List of Publications:

SCOPUS:

Documents: 19; Citations: 237; h – index - 09

(A) Paper Published in referred Journals

- (1) “Iota – carrageenan based polymer electrolyte: impact on ionic conductivity with incorporation of AmNTFSI ionic liquid for supercapacitor”, N. K. Farahana, F. S. Omar, R. Shanti, S. Ramesh, K. Ramesh, Y. K. Mahipal, *Ionics* (2019) 25:3321–3329.
2. “Study of electrical and electrochemical behavior on copper ion conducting nano- composite polymer electrolyte”, T. B. Sahu, M. Sahu, S. Karan, D. K. Sahu, R. C. Agrawal, Y. K. Mahipal, *Ionics* (2018) 24:2885–2892.
3. “Influence of acrylic acid on ethylene carbonate / dimethyl carbonate based liquid electrolyte and its supercapacitor application” N. S. Nadia, F. S. Omar, A. Numan, S. Ramesh, K. Ramesh, Y. K. Mahipal, *Int. J Hydrogen Energy* 42 (2017) 30683 - 30690.
4. “Investigations on materials and ion transport properties of Zn²⁺ conducting nano- composite polymer electrolytes (NCPEs): [90PEO: 10 Zn (CF₃SO₃)₂ + ZnO]”, S. Karan, Manju Sahu, T. B. Sahu, D. K. Sahu, R. C. Agrawal, Y. K. Mahipal, *Materials Today Communications* 13 (2017) 269–274.

5. "Synthesis and characterization of ion transport behavior in Cu²⁺ - conducting nano-composite polymer electrolyte membranes" T. B. Sahu, Manju Sahu, S. Karan, D. K. Sahu, R. C. Agrawal, Y. K. Mahipal, J. Physics D: Appl. Phys. J. Phys. D: Appl. Phys. **50** 275501 (2017).
6. "Conductivity enhancement in K⁺ ion conducting dry Solid Polymer Electrolyte (SPE): [PEO: KNO₃]: A consequence of KI dispersal and nano – ionic effect", P. Kesharwani, D. K. Sahu, Y. K. Mahipal, R C Agrawal, Materials Chemistry and Physics, 193 (2017) 524.
7. "Characterization of ion transport property in hot – press casted Solid Polymer Electrolyte (SPE) films: [PEO: Zn (CF₃SO₃)₂]", S. Karan, T. B. Sahu, Manju Sahu, Y. K. Mahipal, R C Agrawal, Ionics (2017) 23:2721–2726.
8. "An approach to solid – state double layer capacitors fabricated with graphene oxide – doped, ionic liquid based solid co-polymer electrolytes" N. F. A. Fattah, H. M. Ng, Y. K. Mahipal, S. Ramesh, K. Ramesh, Materials 2016 Jun; 9(6): 450.
9. "Enhanced electrochemical performance of cobalt oxide nanocube intercalated reduced graphene oxide for supercapacitor application" A. Numan, N. Duraisamy, F. S. Omar, S. Ramesh, K. Ramesh, Y K Mahipal, RSC Advances, RSC Adv., 2016, 6, 34894.
10. Efficiency of supercapacitor using EC/DMC based liquid electrolytes with methyl methacrylate (MMA) monomer" N. S. Nadia, Y. K. Mahipal, A. Numan, S. Ramesh, K. Ramesh, Ionics (2016) 22:107–114.
11. "Investigations on Ion Transport Properties of Hot-Press Casted Magnesium Ion-Conducting Nano-Composite Polymer Electrolyte (NCPE) films: Effect of Filler Particle Dispersal on Room Temperature Conductivity", R. C. Agrawal, Dinesh Sahu, Y. K. Mahipal, Rehana Ashrafi, Int. J. Materials Chemistry and Physics 139 (2013) 410-415.
- (12) "Materials and ion transport property studies on hot-press synthesized solid polymer electrolyte membranes: (PEO: KIO₃)" R. C. Agrawal*, Y. K. Mahipal, Rehana Ashrafi, Solid State Ionics (North Holland), 192 (2011) 6-8.
- (13) "Study of electrical and electrochemical behavior on hot-press synthesized nano-composite polymer electrolyte membranes: 70PEO: 30 KNO₃ + x SiO₂" R. C. Agrawal*, Y. K. Mahipal, J. Electrochemical Science, 6 (2011) 867-881.
- (14) "Ion Transport Characterization and Cell Potential Discharge Studies on Hot-Press Synthesized Solid Polymer Electrolyte: PEO: NaNO₃", R. C. Agrawal*, Y. K. Mahipal, (Under review), J. Solid State Ionics (2011).
- (15) "Study of ion transport behaviour in a mechanochemically synthesized silver halide mixed composite system: [0.75 AgI: 0.25 AgCl]" R.C. Agrawal*, Y. K. Mahipal, Dinesh Sahu, Geeta Shrivastava, 357 (2011) 3670-3674.
- (16) "Ion transport property studies on PEO–PVP blended solid polymer electrolyte membranes" Angesh Chandra, R. C. Agrawal* and Y. K. Mahipal, J. Phys. D: Appl. Phys. J. Phys. D: Appl. Phys. 42 (2009) 135107.

- (17). “Ion Transport and Battery Discharge Characteristic Studies on Hot-press synthesized Ag^+ - Ion Conducting Nano Composite Polymeric Electrolyte: $(1-x) [90 \text{ PEO}: 10 \text{ AgNO}_3]: x \text{ SiO}_2$ ”- R.C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, New. J. Physics 10 (2008) 043023.
- (18). “Characterization of ion transport property and study of solid state battery discharge performance on newly synthesized Ag^+ ion conducting quaternary solid electrolyte systems: $x [0.75\text{AgI}: 0.25\text{AgCl}] : (1-x) \text{ KI}$ ” - R. C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, European Physical Journal: Applied Physics, 43 (2008) 209.
- (19). “Investigations on electrical and electrochemical properties of Ag^+ - ion conducting quaternary solid electrolyte systems: $x [0.75\text{AgI}:0.25\text{AgCl}]: (1-x) \text{ RbI}$ ” - R. C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, J. Phys. D: Applied Physics 40 (2007) 4714.

(B) Paper Published in Conference Proceedings:

1. “Conductivity Studies on Na^+ - ion conducting 2 – phase inorganic composite electrolyte and composite polymer electrolyte”, Manju Sahu, Tripti Bala Sahu, Shrabani Karan, Y. K. Mahipal, D. K. Sahu, R. C. Agrawal, 7 (3-4), p. 423, 2017.
2. “Ion transport and materials property studies on fumed silica dispersed Mg^{2+} - conducting nano – composite polymer electrolytes (NCPEs)”, D. K. Sahu, Y. K. Mahipal, R. C. Agrawal, 7 (3-4), p. 451, 2017.
3. “Ion transport property study in Ag^+ - ion conducting solid polymer electrolyte films: $(1-x) \text{ PEO}: x \text{ AgCOOCH}_3$ ”, Tripti Bala Sahu, Manju Sahu, Shrabani Karan, Priyanka Kesharwani, Y. K. Mahipal, D. K. Sahu, R. C. Agrawal, 7 (3-4), p. 456, 2017.
4. “Electrical and Electrochemical Properties of New Mg^{2+} -Ion Conducting Polymer Electrolyte Membranes”, R. C. Agrawal, Dinesh K Sahu, Y. K. Mahipal, Rehana Ashrafi, Proc. 13th Asian Conf. on Solid State Ionics – Ionics For Sustainable World, World Scientific, Singapore, p.144-151, 2012.
5. “Ion Transport And All-Solid-State Battery Characterization Studies on Mg^{2+} - Ion Conducting Nano-Composite Polymer Electrolytes (NCPEs): $(75\text{PEO}: 25\text{MgSO}_4) + x\text{MgO}$ ” Proc. 13th Asian Conf. on Solid State Ionics – Ionics For Sustainable World, World Scientific, Singapore, p.160-168 2012.
6. “Electrical property studies on hot-press casted synthesized nano-composite polymer electrolyte (NCPE) membranes: $[(70\text{PEO}: 30 \text{ MgSO}_4) + x\text{SiO}_2]$ ” R. C. Agrawal, Y. K. Mahipal, Rehana Ashrafi, ‘Proc. 12th Asian Conf. on Solid State Ionics, Wuhan Univ. of Technology Press, p.874-879, 2010.
7. “Ion transport characterization and cell potential discharge studies on hot-press synthesized polymer electrolyte: $\text{PEO}: \text{NaI}$ ”, R. C. Agrawal, Dinesh Sahu, Y. K. Mahipal, Proc. 12th Asian Conf. on Solid State Ionics, Wuhan Univ. of Technology Press, p.1075-1080, 2010.

8. "Study of ion conduction behaviour in solid polymer electrolyte membranes: (PEO: KNO₃) synthesized by a novel hot-press technique" – R. C. Agrawal, Y. K. Mahipal, Angesh Chandra and Alok Bhatt, 'Proc. Electroactive Polymers: Materials & Devices Vol. III (Mac Millan Pub., New Delhi) p. 231 (2009).
9. "Ion transport property studies on hot-press synthesized ion conducting solid polymer electrolytes: (1-x) PEO: x NaPO₃" R. C. Agrawal, Y. K. Mahipal, Dinesh Sahu, Rehana Ashrafi, 'Proc. 53rd National Symposium on Solid State Physics 53 (2008) p. 951.
"Hot – Pressed – Synthesized Ag⁺- Ion Conducting Nano Composite Polymeric Electrolyte Membrane: Solid – state Thin Film Battery Application" R. C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, Dinesh Sahu, 'Proc. National Conference on Advanced Materials and Nanotechnology', Bhilai (2008), P. 14.
10. "Electrical Property Studies on a Novel Hot-press-synthesized Na-Ion Conducting Polymeric Membranes: (1-x) PEO: x NaNO₃" - R.C. Agrawal*, Angesh Chandra, Y. K. Mahipal, Asha Singh, 'Proc. 11th Asian Conf. on Solid State Ionics: New Materials for Pollution Free Energy Devices' (Eds) B.V.R. Chowdari, ibid (2008) p. 561.
11. "A Novel Hot-press/ dry Casted Solid Polymer Electrolyte (SPE) Films: (1-x) PEO: x KOH; Characterization of Ion Transport Behaviour" - R.C. Agrawal*, Angesh Chandra, Y. K. Mahipal, Beena R., 'Proc. 11th Asian Conf. on Solid State Ionics: New Materials for Pollution Free Energy Devices' (Eds) B.V.R. Chowdari, ibid (2008) p. 567.
12. "Investigations on Hot-press-synthesized Nano Composite Polymer Electrolyte (NCPE) Membranes: (1-x) [70PEO:30KIO₃]: x SiO₂" - R.C. Agrawal*, Angesh Chandra, Y. K. Mahipal, Dinesh Sahu, Kamlesh Pandey, 'Proc. 11th Asian Conf. on Solid State Ionics: New Materials for Pollution Free Energy Devices' (Eds) B.V.R. Chowdari, ibid (2008) p. 573.
13. "Cell-potential discharge performance studies on solid state batteries based on newly synthesized fast Ag⁺ ion conducting vanadate / phosphate glass electrolytes" - R.C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, Dinesh Sahu, 'Proc. 52nd National Symposium on Solid State Physics 52 (2007) 509.
14. "Synthesis and ion transport studies on a hot-pressed Ag⁺ ion conducting solid polymer electrolytes: (1-x) PEO : x [0.7(0.75AgI:0.25 AgCl):0.3 RbI]" - R.C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, 'Proc. 2nd ICEP (Electro active Polymers: Materials & Devices)' Vol. 2 (2007) 395.
15. "Cell Potential Discharge Characteristic Studies on Thin Film Solid State Battery Based on Hot- Pressed Ag⁺ Ion Conducting Solid Polymer Electrolytes: 70PEO: 30 [0.7(0.75AgI: 0.25 AgCl): 0.3 MI] (Where M = Rb, K)" – R.C. Agrawal*, Angesh Chandra, Alok Bhatt, Y. K. Mahipal, 'Proc. National Conference on Physics of Nano Structured Functional Materials', Bhilai (2007), P. 68.

(b) Subsidiary Topic of Research

“Ion Conducting Electrolytes and Nano-Composites”

(c) Special Research Training/ Experience at IIT Powai, Bombay

- (i) X-ray diffraction studies from 10K-1450K.
- (ii) Scanning Electron Microscopy.
- (iii) DSC.
- (iv) FTIR
- (v) Impedance Spectroscopy (IS)
- (vi) Ball Mill