

## **Department of Physics**

### **Annual Report 2021-2022**

The Department of physics which was started in the year 1926 one year after the founding of Loyola College has grown like a banyan tree in all dimensions. The dimensions are academic, co-curricular activities, cultural, sports and research. Currently, 500 plus students 30 teaching staff and seven non-teaching staff are there in the department. The department has well equipped two UG laboratories, one PG laboratory, a spacious workshop for skill development, state of the art centre for research instruments and a separate space for every research guides. The department is currently headed by Dr S Jerome Das the 10<sup>th</sup> successor in the list of hods. The Loyola Physics Association (LPA) an authorized body of department of physics coordinated the events of co-curricular, cultural, sports and research activities of the department of physics. Students Office bearers of LPA supported in organizing various events. The inauguration of activities of Loyola Physics association was held on 24<sup>th</sup> November 2021 in Lawrence Sundaram Hall on Loyola College Chennai 34.

Rev. Dr. Francis P. Xavier, rector, Loyola College was the chief guest and Dr. Daniel Chellapa, eminent nuclear Scientist was the guest of honour for this ceremony. In-house experts generously contributed to motivate the students outside the subject. In-line with this two guest lectures titled “How to write a winning project proposals, then Innovation and Intellectual property rights“ were delivered by the faculty members of the department of Physics. On 2<sup>nd</sup> March 2022 and 18<sup>th</sup> April 2022. LPA organized an International conference on Material Science as Dr. S. Prathap as Convener and Dr. M. Victor Antony Raj as co-convener on 17<sup>th</sup> March 2022. 2<sup>nd</sup> year post graduate students of the department of physics were given preference in presenting papers and posters in the conference and to get exposure about conferences.

Dr. S. Jerome Das first Endowment lecture instituted by the well-wishers and students of Dr. S. Jerome Das was organized on 25<sup>th</sup> March 2022 and delivered by Dr. Sunil Varma, Head Bio-material characterization Lab RRCAT, Indore.

Dr. P. Sagayaraj 8<sup>th</sup> and 9<sup>th</sup> Endowment lecture was organized on 4<sup>th</sup> April 2022 and delivered by Dr. Kavitha, group Head and Scientist 'D' Materials and Metallurgy group CMTI, Bangalore and Dr. P. Shanmugam chief Scientist and Head, Environmental Science Lab CLRI Chennai. Four of the Faculty members of the department of physics served as experts, chairpersons and resource persons in 9 seminar, conferences and workshops.

'7' Faculty members are recognized 'Ph.D' guides of the university of madras, and currently guiding 32 students.

Six students were awarded Ph.D during this academic year 2021-22 by the University of Madras from the department of physics, Loyola college, Chennai-34.

Two of our faculty members completed 15 orientations and 35 refresher courses during this academic year.

Our faculty members published 29 Research articles in Scopes indexed journals, presented 8 papers in International conferences and two book chapters with international publishers during the academic year 2021-2022.

### **Research projects and awards**

Dr. J. Merline shyla completed a research project to the tune of 60 lakhs during this academic 2021-22 from DST-SERB.

Two undergraduate and eight post graduate students have received, students research projects to the tune of Rs 1,32,500 from Loyola research park and Tamil Nadu State Council for Science and Technology. 3 faculty members and 7 research scholars received Internship and placement Research awards.

Final year post graduate and final year under graduate students underwent internship in 20 industries and institution during this academic year.

Seventeen students from the department of physics were placed with an average salary of 6 Lakes per annum.

Companies like NIELSEN IQ, ICICI Bank, HDFC Bank, Sutherland Cognizant, Mr Cooper, ZIFO RND solutions, RAMANA VIDYALAYA, BYJUS and INFOSYS were the Recruiters. The Department of physics whole heartedly thank our recruiters.

## **Research Publications**

### **Dr. P. Sagayaraj**

1. M. Divya, P. Malliga, P. Sagayaraj, A. Joseph Arul Pragasam, Analysis on Dielectric, Thermal, and Mechanical Characteristics of Nickel Boro Phthalate NLO Crystal for Optoelectronic Applications, Crystal Research and Technology. 56 (2021).
2. S. Joseph, A.J.P. Paul Winston, S. Muthupandi, P. Shobha, S.M. Margaret, P. Sagayaraj, Performance of Natural Dye Extracted from Annatto, Black Plum, Turmeric, Red Spinach, and Cactus as Photosensitizers in TiO<sub>2</sub>NP/TiNT Composites For Solar Cell Applications, Journal of Nanomaterials. 2021 (2021).
3. S.M. Margaret, A.J.P. Paul Winston, S. Muthupandi, P. Shobha, P. Sagayaraj, Enhanced Photocatalytic Degradation of Phenol Using Urchin-Like ZnO Microrod- Reduced Graphene Oxide Composite under Visible-Light Irradiation, Journal of Nanomaterials. 2021 (2021).
4. G.J. Shanmuga Sundar, S.M. Ravi Kumar, P. Sagayaraj, S. Selvakumar, C. Shanthi, S. Sivaraj, R. Gunaseelan, Structural, mechanical, thermal, electrical, second- and third-order nonlinear optical characteristics of MCBT NLO crystal for optoelectronics device and laser applications, Bulletin of Materials Science. 44 (2021).
5. P. Shobha, A.J.P. Paul Winston, S. Sunil, T.M. David, S.M. Margaret, S. Muthupandi, P. Sagayaraj, Facile Synthesis of rGO/Mn<sub>3</sub>O<sub>4</sub> Composite for Efficient Photodegradation of Phenol under Visible Light, Journal of Nanomaterials. (2021).
6. S.J. Sundaram, A.A. Raj, R.J. Vijay, M. Jaccob, P. Sagayaraj, Investigation on nucleation, growth and physical properties of low soluble 4-N, N-dimethylamino-4-N- methylstilbazolium 4-aminotoluene-3-sulfonate crystal – A potential NLO material, Journal of Molecular Structure. 1241 (2021).

### **Dr. S. Jerome Das**

1. S. Anitha, P.S. Latha Mageshwari, R. Priya, R. Ragu, S. Jerome Das, Prospective theoretical investigations of optical, dielectric, mechanical and third-order NLO property in potassium tri-hydrogen di-succinate single crystal, Chinese Journal of Physics. 76 (2022) 145–171.

2. S. Anitha, R. Priya, P.S.L. Mageshwari, S.J. Das, Dielectric relaxation and optical properties in ferroelectric bis(methylammonium) tetrachloro zincate single crystal, *Ferroelectrics*. 585 (2021) 211–229.
3. Aslinjensipriya, R.S. Reena, R. Ragu, S.G. Infantiya, G. Mangalam, C.J. Raj, S.J. Das, Exploring the influence of tin in micro-structural, magneto-optical and antimicrobial traits of nickel oxide nanoparticles, *Surfaces and Interfaces*. 28 (2022).
4. S. Deepapriya, J.D. Rodney, S.J. Das, S.L. Devi, P. Nagaraju, J.R. Anusha, S. Perumal, J.E. Jose, C.J. Raj, Synergetic effects of lanthanum substituted Ni-Zn-Cu-Co ferrite nanocomposite with enhanced NH<sub>3</sub> sensing performance, *Journal of Environmental Chemical Engineering*. 9 (2021).
5. J. Emima Jeronsia, R. Ragu, A. Jerline Mary, S. Jerome Das, Elucidating the structural, anticancer, and antibacterial traits of Punica granatum peel extracts-mediated Ag and Ag/GO nanocomposites, *Microscopy Research and Technique*. 85 (2022) 44–55.
6. S.A. Jacob, R. Ragu, M.M. Jacqueline, A. Daisy, S.J. Das, Exploring the consequences of lanthanum incorporation on micro-structural, nanoscale morphological and magnetic traits on manganese dioxide nanoparticles, *Journal of Materials Science: Materials in Electronics*. 33 (2022) 6856–6871.
7. C.J. Raj, R. Manikandan, M. Rajesh, P. Sivakumar, H. Jung, S.J. Das, B.C. Kim, Cornhusk mesoporous activated carbon electrodes and seawater electrolyte: The sustainable sources for assembling retainable supercapacitor module, *Journal of Power Sources*. 490 (2021).
8. R.S. Reena, A. Aslinjensipriya, S.G. Infantiya, P.A. Vinosha, M. Jose, S. Krishnan, S.J. Das, Examining the effect of pH on the structural, elastic, magnetic, and photocatalytic activities of Cr<sup>3+</sup>Co<sub>3</sub>O<sub>4</sub> nanoparticles, *Journal of Materials Science: Materials in Electronics*. 32 (2021) 24997–25017.
9. J.D. Rodney, S. Deepapriya, M.C. Robinson, S.J. Das, S. Perumal, P. Sivakumar, H. Jung, B.C. Kim, C.J. Raj, Cu<sub>1-x</sub>RE<sub>x</sub>O (RE = La, Dy) decorated dendritic CuS nanoarrays for highly efficient splitting of seawater into hydrogen and oxygen fuels, *Applied Materials Today*. 24 (2021).
10. J.D. Rodney, S. Deepapriya, M.C. Robinson, C.J. Raj, S. Perumal, B.C. Kim, S. Krishnan, S.J. Das, Dysprosium doped copper oxide (Cu<sub>1-x</sub>Dy<sub>x</sub>O) nanoparticles enabled bifunctional electrode for overall water splitting, *International Journal of Hydrogen Energy*. 46 (2021) 27585–27596

### **Dr. S. Pauline**

1. Persis Amaliya, S. Anand, S. Pauline, Structural, magnetic, and impedance properties of  $\text{Co}_{1-x}\text{ZrxFe}_2\text{O}_4$  nanocrystallites by PEG-assisted sol-gel route, *Journal of the Australian Ceramic Society*. 57 (2021) 249–261.
2. M.A. Janifer, S. Anand, C.J. Prabagar, S. Pauline, Structural and optical properties of  $\text{BaSnO}_3$  ceramics by solid state reaction method, in: *Materials Today: Proceedings*, 2021: pp. 2067–2070.
3. C.J. Prabagar, S. Anand, M.A. Janifer, S. Pauline, Structural and magnetic properties of Mn doped cobalt ferrite nanoparticles synthesized by Sol-Gel auto combustion method, in: *Materials Today: Proceedings*, 2021: pp. 2013–2019.
4. C.J. Prabagar, S. Anand, M.A. Janifer, S. Pauline, P.A.S. Theoder, Effect of metal substitution (Zn, Cu and Ag) in cobalt ferrite nanocrystallites for antibacterial activities, in: *Materials Today: Proceedings*, 2021: pp. 1999–2006

### **Dr. J. Madhavan**

1. S.B. Bernadsha, V.A.F. Samson, N.J. Simi, J. Madhavan, M.V.A. Raj, Analyzing the efficiency of nanostructured  $\text{Sm}^{3+}$ - and  $\text{Gd}^{3+}$ -doped  $\text{TiO}_2$  and constructing DSSCs using efficacious photoanodes, *Journal of Materials Science: Materials in Electronics*. 33 (2022) 6446–6455.
2. S. Bharathi Bernadsha, V. Anto Feradrick Samson, J. Madhavan, M. Victor Antony Raj, Comparative study of the morphological and optical properties of  $\text{RE}^{3+}$  ( $\text{Nd}^{3+}$ ,  $\text{Dy}^{3+}$ ) doped  $\text{TiO}_2$ : A pursuit for suitable anode material for DSSCs, *Materials Letters*. 288 (2021).
3. V.A.F. Samson, S.B. Bernadsha, A.J.P. Paul Winston, D. Divya, J. Abraham, M.V.A. Raj, J. Madhavan, rGO Sheets/ $\text{ZnFe}_2\text{O}_4$  Nanocomposites as an Efficient Electro Catalyst Material for  $\text{I}_3^-/\text{I}^-$  Reaction for High Performance DSSCs, *Journal of Inorganic and Organometallic Polymers and Materials*. 32 (2022) 1183–1189.

### **Dr. J. Merline Shyla**

1. K. Pugazhendhi, B. Praveen, D.J. Sharmila, J. Sahaya Selva Mary, P. Naveen Kumar, V. Bharathilenin, J. Merline Shyla, Plasmonic  $\text{TiO}_2/\text{Al}@\text{ZnO}$  nanocomposite-based novel dye-sensitized solar cell with 11.4% power conversion efficiency, *Solar Energy*. 215 (2021) 443–450.
2. E.M. Arnold, J.A. Robinson, J.K. Agnes, S. Padmaja, P.N. Kumar, J.M. Shyla, Hydrothermally synthesized  $\text{NiCo}_2\text{O}_4$  nanostructures for energy storage applications, in: *Materials Today: Proceedings*, 2021: pp. 2025–2029.

3. S. Padmaja, B.P. Emmanuel, J.K. Agnes, E.M. Arnold, K. Pugazhendhi, J.M. Shyla, Novel 1D TiO<sub>2</sub> nanocones for proficient charge transfer in photovoltaic thin films, in: *Materials Today: Proceedings*, 2021: pp. 1044–1049.
4. D.J. Sharmila, V. Suresh, B.P. Emmanuel, E.M. Arnold, B. Praveen, K. Pugazhendhi, J.M. Shyla, Optimization of ZnO doped TiO<sub>2</sub> nanopillars as photoanode for dye sensitized solar cells, in: *Materials Today: Proceedings*, 2021: pp. 1166–1169.

#### **Dr. Mary Linet**

1. Alinda Shaly, G. Hannah Priya, J. Mary Linet, An exploration on the configurational and mechanical aspects of hydrothermally procured MgO/HA bioceramic nanocomposite, *Physica B: Condensed Matter*. 617 (2021).
2. S. Sharon Tamil Selvi, G. Hannah Priya, R. Ragu, D. Ancelia, L. Allwin Joseph, J. Mary Linet, Exploring the Outcomes of Sulphur Sources on ZnO/CdS Nanocomposites Towards Photocatalytic Degradation of Mordant Black 11 Dye, *Journal of Cluster Science*. 33 (2022) 375–386.

#### **Dr. Nirmala Jothi**

1. Facile Green synthesis and characterization of Gold nanoparticles using Fenugreek seeds and Honey. Lilly Anitha .M. Riya .J.Rinita.J Christma Eunice .P. and N.S. Nirmala Jothi. *Journal of Physics -IOP Publishing* - doi.10.1088/1742-6596/2070/1/012048. Impact Factor -3.729.

#### **Dr. M. Victor Antony Raj**

1. S. Bharathi Bernadsha, V. Anto Feradrick Samson, J. Madhavan, M. Victor Antony Raj, Comparative study of the morphological and optical properties of RE<sup>3+</sup> (=ND<sup>3+</sup>, DY<sup>3+</sup>) doped TiO<sub>2</sub>: A pursuit for suitable anode material for DSSCs, *Materials Letters*. 288 (2021).

#### **Dr. J. P Angeleena**

1. J.P. Angeleena, A. Stanley Raj, J. Viswanath, D. Muthuraj, Evaluation and forecasting of PM<sub>10</sub> air pollution in Chennai district using Wavelets, ARIMA, and Neural Networks algorithms, *Pollution*. 7 (2021) 55–72.

### **Mr. C. Joseph Prabagar**

1. M.A. Janifer, S. Anand, C.J. Prabagar, S. Pauline, Structural and optical properties of BaSnO<sub>3</sub> ceramics by solid state reaction method, in: *Materials Today: Proceedings*, 2021: pp. 2067–2070.
2. C.J. Prabagar, S. Anand, M.A. Janifer, S. Pauline, Structural and magnetic properties of Mn doped cobalt ferrite nanoparticles synthesized by Sol-Gel auto combustion method, in: *Materials Today: Proceedings*, 2021: pp. 2013–2019.
3. C.J. Prabagar, S. Anand, M.A. Janifer, S. Pauline, P.A.S. Theoder, Effect of metal substitution (Zn, Cu and Ag) in cobalt ferrite nanocrystallites for antibacterial activities, in: *Materials Today: Proceedings*, 2021: pp. 1999–2006.

### **Dr. A. Stanley Raj**

1. J.P. Angelena, A. Stanley Raj, J. Viswanath, D. Muthuraj, Evaluation and forecasting of PM<sub>10</sub> air pollution in Chennai district using Wavelets, ARIMA, and Neural Networks algorithms, *Pollution*. 7 (2021) 55–72.
2. A. Stanley Raj, B. Chendhoor, Impact of climate extremes of el nina and la nina in patterns of seasonal rainfall over coastal Karnataka, India, *Springer Climate*. (2021) 227–242.
3. A. Stanley Raj, H. Mary Henrietta, K. Kalaiarasi, M. Sumathi, Rethinking the Limits of Optimization Economic Order Quantity (EOQ) Using Self Generating Training Model by Adaptive-Neuro Fuzzy Inference System, *Communications in Computer and Information Science*. 1374 (2021) 123–133.

### **Dr. K. Pugazhendhi**

1. K. Pugazhendhi, B. Praveen, D.J. Sharmila, J. Sahaya Selva Mary, P. Naveen Kumar, V. Bharathilenin, J. Merline Shyla, Plasmonic TiO<sub>2</sub>/Al@ZnO nanocomposite-based novel dye-sensitized solar cell with 11.4% power conversion efficiency, *Solar Energy*. 215 (2021) 443–450.
2. S. Padmaja, B.P. Emmanuel, J.K. Agnes, E.M. Arnold, K. Pugazhendhi, J.M. Shyla, Novel 1D TiO<sub>2</sub> nanocones for proficient charge transfer in photovoltaic thin films, in: *Materials Today: Proceedings*, 2021: pp. 1044–1049.
3. D.J. Sharmila, V. Suresh, B.P. Emmanuel, E.M. Arnold, B. Praveen, K. Pugazhendhi, J.M. Shyla, Optimization of ZnO doped TiO<sub>2</sub> nanopillars as photoanode for dye sensitized solar cells, in: *Materials Today: Proceedings*, 2021: pp. 1166–1169.

## **Extra-curricular activities and sports**

The students of department of physics participated in various cultural and extracurricular activities organized by other colleges.

Our students won overall championship in Department level competitions organised by Presidency college, Eithiraj College and Madras Christian college.

Two of our students bagged first place in innovative projects/prototype at St. Joseph's college Trichy and received Rs 50,000 cash price.

Our students won second place in 100 meter relay and third place in 100m sprint at Loyola annual sports-meet.

Thus the students and faculty members of the department of physics actively involved in academic, research, co-curricular and extra-curricular activities during the academic year 2021-22.