

# Rasathanthram



## MESSAGE FROM HEAD OF THE DEPARTMENT

It truly is astounding to see how the Postgraduate Department of Chemistry, has grown in the past 51 years since its establishment in 1966. This progress would not have been possible, if not for the wonderful faculty and students of this department.

Our department has been quite blessed, with the good fortune to always receive dedicated students who have helped in building up this department by giving back as much as they have received. It has always been our top priority to encourage the holistic development of our students, by encouraging them to take part in co-curricular and extra-curricular activities, and by instilling in them ethics and moral values along with sound knowledge about the subject. We aim to nurture bright and enthusiastic young women, who will have in them the drive to make the world a better place to live in. We make sure that they are eco literate and gender sensitized.

Through a blend of course work and projects, the department equips students with the ability to apply knowledge of science, to work effectively in multi-disciplinary teams and to take up leadership. We help them to attain technical expertise. Our curriculum is being regularly updated to be contemporary, reflecting real time developments in the field of Chemical Sciences.

The success of this department is a result of the persistent work and dedication of both the teaching and non-teaching staff, who have always lent us their support and advice in carrying out all form of activities. We will always remain grateful to the Almighty for granting us strength and guidance.

I congratulate Dr. Elizabeth Kuruvilla and Ms. Georgina Grace, the editors and their dedicated committee for their valuable efforts in bringing out this issue. I wish them all success!

Dr. Ushamani M



Athulia C. G. I DC Chemistry

## Congratulations



Nimmya Ann Mathews

Ms. Nimmya Ann Mathews of MSc. Chemistry 2013-14 batch qualified for the UGC-JRF and Ms. Amruthum Linnet qualified for NET in the UGC-CSIR examination held on June 2017.



Amruthum Linnet

Ms. Amruthum Linnet also qualified the GATE examinations in 2018.



Riya Martin

Ms. Riya Martin and Ms. Joselin M. J of III DC were selected for National Science Academy's Summer Research Internship for May-July 2018. Riya will be working at IISER-TVM and Joselin will be working at CEMRI, Durgapur.



Joselin M. J

Prathibha S. Prabhu, Jinju John, Parvin Fathima and Rosemary and Ansiya T. S. from I DC Chemistry joined IISER (TVM) and NIIST (CSIR – TVM), respectively, for a month long summer training programme organized by the Dept. of Chemistry under DBT STAR College Scheme in collaboration with IISER and NIIST.

## പ്രഭാത പ്രാർത്ഥന

പിതാവായ ദൈവമേ, ഈ പ്രഭാതത്തിൽ അങ്ങയുടെ സന്നിധിയിൽ ഞാൻ പ്രാർത്ഥിക്കുമ്പോൾ എന്തെങ്കിലും ഭൗതികതലങ്ങളിൽ അനുഗ്രഹിക്കണമേ. ദൈവമേ ചിലപ്പോഴൊക്കെ എന്റെ അദ്ധ്വാനം വ്യർത്ഥം ആയി പോകുന്നു. രാത്രി മുഴുവൻ അദ്ധ്വാനിച്ചിട്ടും മറ്റു മത്സ്യം പോലും ലഭിയ്ക്കാതെ കഷ്ടപ്പെട്ട് പോയ ശിഷ്യന്മാർക്ക് നീ വല നിറയെ മത്സ്യം നൽകി അനുഗ്രഹിച്ചല്ലോ. ദൈവമേ അദ്ധ്വാനം ഫലം തരാതെ പോകുന്ന എന്റെ ജീവിതത്തിലേക്ക് നീ തിരിഞ്ഞു നോക്കണമേ. ദൈവമേ നിന്റെ ഇടപെടൽ ജീവിതത്തിൽ ഉണ്ടാകുമ്പോൾ എനിയ്ക്ക് വലിയ സമ്പത്ത് കൈവരുമെന്നു ഞാൻ അറിയുന്നു. കർത്താവേ അങ്ങ് വലിയ തോബിയായിസിലുടെ ഇപ്രകാരം പറഞ്ഞുവല്ലോ "മകനേ, നമ്മൾ ദരിദ്രരായിത്തീർന്നതിൽ നിനക്ക് ആധി വേണ്ടാ. നിനക്കു ദൈവത്തോടു ദക്തി ഉണ്ടായിരിക്കുകയും നീ പാപത്തിൽ നിന്ന് ഒഴിഞ്ഞുനിൽക്കുകയും അവിടുത്തെക്കു പ്രീതികരമായത് അനുഷ്ഠിക്കുകയും ചെയ്താൽ നിനക്കു വലിയ സമ്പത്തു കൈവരും." (തോബിത്ത് 4:21) ദൈവമേ എന്റെ അദ്ധ്വാനം അല്ല നിന്റെ കൃപയാണ് എന്നെ സമ്പന്നൻ ആക്കുന്നത് എന്ന് ഞാൻ അറിയുന്നു. ദൈവമേ എന്റെ മേൽ അങ്ങയുടെ കരുണ ചൊരിയണമേ. ഒന്നും ഇല്ലാതെ അമ്മാവനായ ലാബാന്റെ അടുക്കലേക്ക് ഒളിച്ചോടി പോയ യാക്കോബിനെ അങ്ങ് വലിയ സമ്പന്നൻ ആക്കിയല്ലോ. കർത്താവേ എന്റെ കൈകളിലും ഒന്നും ഇല്ല. ഞാൻ ദയചകിതനാണ്. എങ്കിലും നിന്റെ വാഗ്ദാനങ്ങളിൽ ഞാൻ വിശ്വസിക്കുന്നു. നിന്റെ വചനത്തിൽ അടിയുറച്ചു വിശ്വസിച്ചുകൊണ്ട് ഞാൻ ജീവിക്കുമ്പോൾ എന്നെയും വലിയ സമ്പത്തിനു ഉടമയാക്കണേ. ദൈവമേ, ഇന്നേ ദിവസം അങ്ങ് എന്നെ അനുഗ്രഹിക്കുന്നതിനെ ഓർത്തു ഞാൻ അങ്ങേയ്ക്ക് നന്ദി പറയുന്നു. എന്റെ എല്ലാ അദ്ധ്വാനങ്ങളിലും അങ്ങ് കൂടെയുണ്ടായി വലിയ ഫലം

പുറപ്പെടുവിക്കുന്നതിനെ ഓർത്തു ഞാൻ അങ്ങേയ്ക്ക് നന്ദി പറയുന്നു. ഈശോയെ നന്ദി. ഈശോയോ സ്മരണം.

പ്രാർത്ഥനകൾ ദൈവ സമക്ഷം സമർപ്പിക്കുന്ന റഫായേൽ മാലാഖേ, ഞങ്ങൾക്ക് വേണ്ടി പ്രാർത്ഥിക്കണമേ.

ആമേൻ.

Benny K. V.  
Laboratory Assistant  
Department of Chemistry



## From the Editors

Rasathanthram is the annual newsletter of the department of chemistry, St. Teresa's College and this is the fourth volume of the newsletter which was started in 2014. We have immense pleasure in bringing out this volume and thank Dr. Ushamani M, HOD, for giving us this opportunity. We also thank all the faculty members, non-teaching staff and the students for their support.

As mentioned in the message by the HOD, the department strives to create an environment that nurtures bright and confident young women. Throughout history, women have had difficulties seeking education, finding employment doing research and getting credit for their work. In spite of this, there are plenty of women who have overcome all the obstacles in order to make their marks in history. Marie Curie was the first woman to win a Nobel Prize, the first person and only woman to win twice, the only person to win a Nobel Prize in two different sciences. Dorothy Hodgkin pioneered the use of X-ray Crystallography for probing the structures of biomolecules. She won the 1964 Nobel Prize in Chemistry for determining the structure of vitamin B12. Rosalind Franklin was an English chemist and crystallographer whose work on DNA led to the discovery of the double helical structure of DNA.

A positive influence of studying in a women's college is that one is not stopped by the gender biases that may exist in other co-educational institutes. We are sure that a student graduating from the department will have self-confidence and self-esteem that will carry her forward whatever be the circumstances or challenges.

Dr. Elizabeth Kuruvilla  
Ms. Georgina Grace T. W

## ELECTRICITY FROM RED WINE

Bad wine bottles can throw a wrench in your dinner party, but researchers in the US and India says it could also lower your energy bills. Using the left over vinegar and sugar in improperly fermented wine, those scientists are devising novel methods to turn waste water from vineyards into electricity and hydrogen, cleaning the water in the process.

A lot of water is required to process grapes into the fermented sugars that give wine its characteristic quality. The waste water coming out of vineyard is packed with unfermented sugars, biomass and improperly fermented vinegar. Generally all that waste water has to be cleaned and that can be costly.

So the researchers are using microbes to convert those waste products into energy rather than dumping them into an energy wasting treatment cycle. Using widely available bugs, a fridge sized microbial electrolysis cell converts waste water to power by first converting sugar and vinegar into

electricity and using that electricity to split the water molecules into hydrogen and oxygen, which slips harmlessly back into the atmosphere. Much larger units would be needed to clean the waste water of an entire winery, but the proof of electrolysis cell seems to be a viable way to clean a winery's waste water without pulling tons of power off the grid.

Using two different bacteria that render vintage undrinkable researchers have designed a fuel cell that allows one bacteria to break the sugar into acetic acid and the other to convert the acetic acid into electricity. The power produced can eventually treat waste water or power day-to-day operations without the use of hydrocarbon-based energy.

SANTHWANA V  
II DC CHEMISTRY

## Chemistry Association (2017-2018) Inauguration

The department of chemistry has completed fifty glorious years in the pursuit of excellence in Chemistry. Established under the leadership of late Dr. (Sr). Bertille CSST in 1966, and nurtured by outstanding faculty members, the department had always remained tall in the academic scenario of the college. Inauguration of chemistry association of the year 2017-2018 and fresher's day celebration of 1<sup>st</sup> year UG and PG was conducted on 4<sup>th</sup> July 2017. The chief guest was Dr. Bindhu Sharmila T.K., Assistant professor, Maharajas College, Ernakulam. The programme started with a silent prayer and the formal function was presided over by Dr. Ushamani M., Head of the Department of Chemistry. The function was felicitated by COE Dr. Geetha Andrews. The chief guest Dr. Bindhu Sharmila T.K., inaugurated the association activities for the year 2017-2018. She gave a lecture on "An introduction to Nano-biomimetics".

After the inauguration, the new students were formally welcomed and the office bearers of the association assumed their duties officially by receiving badges from the Head of the Department.

The following are the office bearers for the academic year 2017-2018:

Staff in charge-Annu Raju, General Secretary-Shaniya Ansari (III BSc.), III BSc Representative –

Sukanya Kamath, II BSc Representative – Devika, I BSc Representative–Santhi Jestin, II PG Representative– Snehamol K J, I PG Representative – Stenia Varghese

Various competitions and entertainment programmes were conducted for the new batch. Miss Fresher competition was conducted for 1<sup>st</sup> year UG and PG students. Santhi Jestin I DC and Stenia Varghese of I PG were crowned as Miss Fresher by the head of the department. The first runner up was Swarna S. Chonnappally and the second runner up was Athulya C.G. Miss Shanthi Jestin was selected as the I DC representative of chemistry association.



## 1. Launching of Teresian Publishing House and Book release

The launching of Teresian Publishing House organized by the Department of Chemistry was held on November 14, 2017. **Dr. Mahesh Hariharan**, Associate Professor and Head, School of Chemistry, IISER, TVM was the chief guest. On the occasion two books written jointly by the entire faculty of the department for the Complimentary Chemistry courses of Semester II and IV for B.Sc. Botany, Zoology and Home Science was published under the banner of Teresian Publishing House. Dr. Sajimol Augustine M., Principal, St.Teresa's College and the chief guest Dr. Mahesh Hariharan released the two books. The function was followed by a talk by Dr. Mahesh Hariharan on the topic “**Ultrafast Processes in Chemical and Biological Systems**”.

The book on “**Advanced Inorganic, Organic and Environmental Chemistry**” is written by *Ushamani M., Saritha Chandran A, Mary Lincy K.A, Rupa Kamath and Elizabeth Mary P.A.*

The book on “**Advanced Organic Chemistry**” is written by *Jaya T Varkey, Annu Raju, Elizabeth Kuruvilla, Rani Maria Cyriac and Stephy P.S.*



## 2. State Level Seminar on Environmental Sustainability: Changing Phases and Book Release on Environmental Studies

On 15<sup>th</sup> November, 2017, the Department of Economics and Department of Chemistry organized an interdisciplinary seminar for the first time.

The chief guests were **Dr. E.P Yeshodharan**, Emeritus Professor, School of Environmental Studies, CUSAT and **Dr. Vishakha Varma**, Retired Principal, Panampilly Memorial Government College, Chalakudy. A book on “**Environmental Studies**” based on the UGC syllabus for undergraduate courses of all branches of higher education, authored by our staff members

*Dr.Ushamani M (Chemistry), Dr.Sheela D (Botany), Dr.Priya K Nair (English), Dr. Saritha Chandran A (Chemistry) and Swathy Varma (Economics)* was published under the college's very own publication house- the Teresian Publishing House and was released by Dr. (Sr) Vinitha, Director, St.Teresa's College.

Dr. E.PYeshodharan gave a lecture on “Sustainable Environment: How far? How long?”

Dr. Vishakha Varma talked on the “The issue of sustainable development”.

## 3. National Seminar GC-MS, LC-MS and NMR spectroscopy

National seminar on **GC-MS, LC-MS and NMR spectroscopy** was organized by Indian Society of Analytical Scientist, Kerala Chapter in association with the Department of Chemistry on 22-9-2017. The one day seminar focused on basics, technology and applications of the three important analytical techniques widely used in chemical, food and pharmaceutical analysis, clinical diagnostics, agriculture and a variety of other fields.

**Dr. Ramakrishnan**, President, Chromatographic Society of India, Mumbai and **Dr. Prathapan**, Associate Professor, Department of Applied Chemistry, CUSAT were the distinguished speakers.



## 4. National Workshop on Microscale Techniques In Experimental Organic And Physical Chemistry

A National Workshop on “**Microscale Techniques in Experimental Organic and Physical Chemistry**” was organized by the Department of Chemistry on 2<sup>nd</sup> and 3<sup>rd</sup> November 2017. Teachers from different colleges, PG students and faculty of the department participated in the workshop.

**Prof. S. Murugan**, HOD of Chemistry (Retired), S. T. Hindu College, Nagerkovil and **Jeya Rajendran**, Assistant Professor, Loyola College, Chennai demonstrated the different techniques used in microscale experiments. The participants got a hands on training on the different techniques and a booklet of the experimental procedures and principles were distributed to all the participants.





## 5. Sr.(Dr.)Bertille Endowment Lecture Series

The Department of Chemistry has been organizing the Sr.(Dr.) Bertille Endowment lecture series since the year 2011 in the loving memory of Sr.(Dr.) Bertille who was the founder head of the Department.

- i) The first of the series for the year 2017-2018 was held on 28-7-2017. **Dr. S. Sugunan**, retired professor, Department of Applied Chemistry, CUSAT and recipient of the “Vasudeva” award by KSCSTE gave the lecture on “**Spectroscopy**”. The lecture series was organised to create awareness about the various opportunities in the field of Spectroscopy and to impart thorough knowledge about the basics of spectroscopic techniques.
- ii) The second of the series was held on 24-8-2017. **Dr. Anu Gopinath**, Assistant professor, Department of Chemical Oceanography, KUFOS delivered lecture on '**Exploring the Arctic- Indian and Global Research Initiatives at a Glance**'. She is a recipient of the “Common Wealth Fellowship, 2012” and was selected for the Arctic expedition in the years 2014, 2015 and 2017.
- iii) The third lecture was organized on 7-10-2017 and was given by **Dr. Krishnaraj M. V**, Assistant professor, Department of Bbotany, Baselius College, Kottayam on the topic “**Bioenergetics**”. He obtained his doctorate from Tropical Botanic Garden and Research Institute, Palode, Trivandrum and has discovered 8 new flowering plant species and has several new records and rediscoveries to his credit.
- iv) On 31-1-2018, the fourth lecture of the series was held with **Aravind K.**, Assistant professor, S.B College, Changanassery as the speaker on “**Computational Chemistry**”. He is a first rank holder of M. G University examinations for both M.Sc. and B.Sc. Chemistry. He was ranked second in the prestigious Junior Research Fellowship of the Council of Scientific & Industrial Research (CSIR) in December 2006.



## 6. Walk with a Scientist- A Student Scientist Interactive Program Series I

As part of the student enrichment program, the Department of Chemistry in collaboration with the Department of Botany initiated an interactive program series “**Walk with a Scientist**” which aims at providing a platform for the students to interact with eminent scientists from academies and industries. The first of the series was held on 17/1/2018. Eminent scientist, **Dr. B. D. Malhotra**, Professor, Department of Biotechnology, Delhi Technological University gave a talk on “**Nanomaterials based Biosensors for Cancer Detection**”. The talk was followed by an interactive session in which professor answered all the queries from the students and also had a vibrant discussion with the students on the recent discoveries in his area of research. The seminar was attended by I and II PG students, Research Scholars from the departments of chemistry, botany, zoology, physics, home science and UG students from B. Voc.



## 7. ICT Training workshop for III DC students

The Department organized a training program cum workshop for the students of III DC Chemistry. **Ms. Sheeba Immanuel**, Associate professor, Department of Computer Applications, St.Teresa's College, Ernakulam gave a talk and demonstration on how to effectively prepare Microsoft power point presentations. It was an interactive session, where the students gained hands on training on Microsoft Power Point Presentations. They also prepared their power points and presented it during the workshop.





## 8. Women Achievers In Science

In order to encourage students to pursue research in science, women scientists from different scientific fields gave lectures and interacted with students on 23-2-2018 in the program “**Women Achievers in Science**”. **Dr. Rani Joseph**, Emeritus Professor of Department of Polymers Science and Rubber Technology, CUSAT and **Dr. Sheela Berchmans**, Chief Scientist and Head, Electrodics and Electrocatalyst Division, CSIR, CECRI were the distinguished guests.



## TROP 2017-2018

The TROP activities for the academic year 2017-18 was inaugurated by Mr. K. S. Mohammed, President, Varapuzha Grama Panchayath. This year's TROP activities were coordinated by Ms. Elizabeth Mary P. A and Ms. Georgina Grace T. W.

The first session of the TROP activities was held on July 21st 2017. The goal was to introduce awareness regarding the need to keep our surroundings clean. The students were provided information by the authorities and they decided to take initiative to clean the local road and premises of Varapuzha Grama Panchayath office. The ward members, the president and the residents guided the students for the same. Students interacted with the waste pickers and helped them in cleaning.

The second session of the TROP activities was held on August 18th 2017. The session was held at St. Joseph's convent, Varapuzha. The students visited the convent and interacted with the residents. Students spoke about the necessity of health and hygiene and educated them about the need of a healthy diet, proper sleep and proper intake of water. The students arranged very innovative and thoughtful classes for the girls, like paper bag making and jewellery making sessions.

Students also gifted the orphanage with 50 books, which included 16 magazines, 7-english books, 24-malayalam books, 2-hindi books and an Oxford Dictionary.



The third session of the TROP activities was held on September 15th 2017. The students held the programme at Marian Sneha Vihar, Varapuzha. It is an institution for differently abled people. The students arranged lunch for them and also distributed gifts.

The fourth session of the TROP activities was held on 22<sup>nd</sup> December 2017 at Karunalayam, Fort Kochi, an institution for mentally and physically challenged. The students organized Christmas lunch, sang Christmas carols and distributed gifts. Items like rice, pulses and sugar were also donated. The students and teachers-in-charge spent one day with them and arranged different entertainment programmes.

On 3/2/18 visited the students of Don Bosco Snehabhavan, Palluruthy. Snehabhavan is used by both children and adults on the street as well as other youths at risk as a day drop-in centre, night shelter and a place where they can receive food, shelter, medical support, legal advice and a listening ear. The students organized a talk on “Memorization techniques and examination fear”. The talk was given by Dr. Geetha Andrews, Associate Professor, St. Teresa's college, Ernakulam.

Elizabeth Mary P. A.  
Assistant Professor (on contract)  
Department of Chemistry



## “Pollution Monitoring of Kaithapuzha Kayal, A Part Of Vembanadu Lake”

Anjaly K C<sup>a</sup>, Greeshma Joseph K<sup>a</sup>, Dr. Annu Raju<sup>a</sup>, Dr. Anu Gopinath<sup>b</sup>

<sup>a</sup>*St. Teresa's College, Ernakulam*

<sup>b</sup>*Assistant Professor, KUFOS, Kochi*

Pollution of the natural environment by heavy metals is a worldwide problem as these metals are indestructible and have toxic effects on living organisms when they exceed permissible limit. The present study focuses on the distribution of heavy metals in the sediments of three stations in Kaithapuzha Kayal collected in four months. Sediments were collected from three regions in Kaithapuzha Kayal. Water from these stations was also sampled for determining the general hydrographic parameters. pH of water and sediments was measured in situ using a digital pH meter. General hydrographic parameters were analyzed by the standard methods. Sediment samples were analyzed for nutrients and heavy metals to understand the spatial distribution of heavy metals. As there are not enough studies reported in this part of the Kaithapuzha Kayal for comparing the sediment quality, information collected through the present study can be used as baseline

data for future monitoring of pollution in Kaithapuzha Kayal. The study revealed the following facts:

- ◆ The general hydrography values: i.e, pH, Dissolved Oxygen, Salinity, Electrical conductivity and Total Dissolved Salts shows greater values during July and August when compared with September and October.
- ◆ Temperature of the bottom and surface waters are found to be greater during September and October.
- ◆ Nutrient status of Kaithapuzha Kayal shows that nitrate and phosphate levels showed similar trends as that of nitrite and ammonia, which is within the safety limits.
- ◆ During July there is low dead organic matter accumulation, probably due to the strong hydrodynamic condition prevailing in this season. On the contrary, the low hydrodynamic condition will

favor the accumulation of sedimentary organic matter.

- ◆ The application of bulk parameters such as biochemical composition and biochemical indices were useful in the assessment of the quality and quantity of sedimentary organic matter and it revealed the fact that the biogeochemistry of sediments was very complex.
- ◆ Different metals show different concentrations in different parts of Kaithapuzha Kayal. The concentration of lead was found only in certain regions. Arsenic showed profound values in most of the regions.

This study gives baseline information about the trace metal enrichment in the sediments along the Kaithapuzha Kayal which also demands detailed research related to metal bioavailability and pollution status of these ecosystems on a micro level.

## “Synthesis And Property Evaluation Of Super paramagnetic Magnetite Nanohybrids”

Sheena Leon A. L<sup>a</sup>, Sneha Mol K. J<sup>a</sup>, Dr. Ushamani M<sup>a</sup> and Dr. Honey John<sup>b</sup>

<sup>a</sup>*St. Teresa's College, Ernakulam*

<sup>b</sup>*Head, Department of Polymer Science and Rubber Technology, CUSAT*

In the last decades, the progress in the synthesis of nanomaterials and their modification for applications has been extended. The properties of synthesized nanoparticles can be improved by preparing their hybrid in nanoscale. In the present work, we have synthesized super paramagnetic magnetite nano-hybrid. Among the various available magnetic materials, iron and its oxides are widely used magnetic nanoparticles due to their unique properties. Out of the various iron oxides, magnetite was engaged in this work, because of its strong magnetic behavior. Modified Massart method was employed to synthesize super paramagnetic Fe<sub>3</sub>O<sub>4</sub> nanoparticle.

We have successfully prepared high purity Fe<sub>3</sub>O<sub>4</sub> nanoparticle using

alkaline co-precipitation method with CTAB as the surfactant. The crystalline particle size and morphology of the sample prepared was analysed using XRD, FTIR, TG, TEM and magnetic property were studied by VSM. The XRD patterns obtained with different concentrations of surfactants and reaction temperature were analysed for assessing the optimum conditions required for the synthesis of the Fe<sub>3</sub>O<sub>4</sub> nanoparticle. The crystalline size of sample calculated was found to be around 8 nm by Scherrer equation. The nanoparticle were characterised for functional group by using FTIR spectrometer. A thermogravimetric curve was used to determine the thermal behavior of Fe<sub>3</sub>O<sub>4</sub> nanoparticle and the final weight loss was found to be 1.02% above 300<sup>o</sup>C. TEM was used to

examine the morphology, particle size and crystallinity of nanoparticle. The data revealed that the Fe<sub>3</sub>O<sub>4</sub> nanoparticle is rhombohedral in shape. Above all, the magnetisation curve of magnetite was measured at room temperature. The curve shows non linear reversible characteristics with no hysteresis exhibiting super paramagnetic behavior. The high saturation magnetisation value of the sample was found to be 54.73 emu/g at room temperature. The Fe<sub>3</sub>O<sub>4</sub> nanoparticles were then converted to a hybrid using graphite oxide. The GO was synthesized by modified Hummer's method. The characterisation of prepared GO sample was done through XRD, TG, FTIR and Raman studies. The XRD pattern helped us to calculate the d spacing and it was

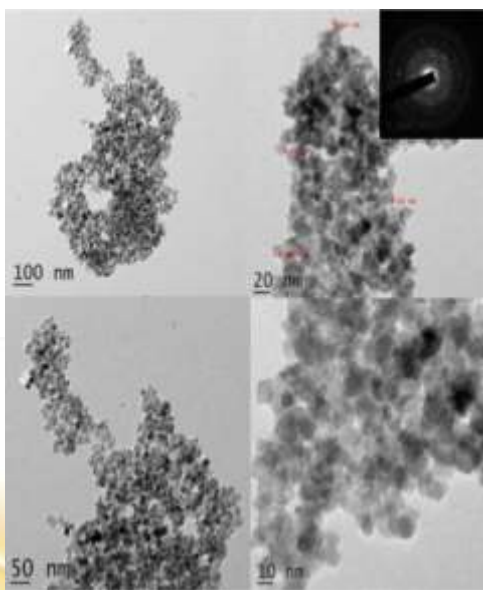


found to be around 8.30 Å. The thermogravimetric analysis was used to determine the thermal behavior of GO particle. It demonstrated two step weight losses, at 59.1 °C and 220.5 °C. The characterization for functional groups present in GO particles was explored using FTIR spectra. The Raman spectrum was also used to study the structure of GO. Finally an inexpensive co-precipitation method was used to synthesize magnetite nanohybrid exhibiting super paramagnetic behavior by incorporating Fe<sub>3</sub>O<sub>4</sub> nanoparticle with GO. The synthesized Fe<sub>3</sub>O<sub>4</sub>/GO nanohybrid was analyzed using TEM, FTIR, XRD and VSM studies. The TEM image revealed the uniform dispersity of nanoparticle over the surface of GO sheets. The FTIR spectrum was used to characterize for functional group present in the sample. The XRD pattern of Fe<sub>3</sub>O<sub>4</sub>/GO nanohybrid indicated all characteristic diffraction peaks for magnetite and GO. Most importantly the magnetic measurement of Fe<sub>3</sub>O<sub>4</sub>/GO nanohybrid was also done. From the magnetization curve, the hybrid prepared is found to be super paramagnetic in nature at room temperature with the M<sub>s</sub> Value at 27.3 emu/g. Based on characterization studies conducted, we conclude that the synthesis and property evaluation of super paramagnetic magnetite nanohybrid were done successfully through this work.



### പെൺമനസ്സ്

എരിയുന്ന കനലെകിലും സൂര്യതേജസി  
 ആ രക്തകിരണങ്ങളിൽ മനുജനായി  
 അമ്മയുടെ പേറനോവിനാൽ  
 മിഴിച്ചിമ്മി ദുമിദേവിയെ കണ്ടു  
 എന്നുടെ തേനൂറും പാലും  
 വിലയേറും വാത്സല്യവും  
 നുകർന്ന് പുഷ്പിനേടിയുരിച്ചു  
 പിന്നെ, .....



HRTEM images of Fe<sub>3</sub>O<sub>4</sub> nanoparticles at different magnifications. The Selected Area Diffracted Pattern pattern is shown in the inset

എന്താണെന്നറിയില്ല, ഏതിനാണെന്നറിയില്ല  
 നിർമാർദ്ദവകരങ്ങളിൽ വിഷഫണമായത്  
 വാർധക്യകാരണവർതൻ  
 പരമ്പരയും കാർന്നുതിന്നതെന്ന്  
 വിരൂപിയെകിലും മന്ദയെകിലും  
 നിറവറ്റാത്ത ചെറുനിരരുവിയാണ് ഞാൻ  
 എന്തിനാണിത്,  
 എന്ന് നറുമലരിൽ ഇതൾ കൊഴിച്ചതു  
 നിറത്തേൻകൂടത്തെ യുടച്ചതു  
 വൈദുര്യമല്ലേലും മരതകമല്ലേലും  
 സ്വയമുരുകുന്ന ആവണവിളകിലേ  
 നിറംപോയ നാലാം തിരിയെല്ലെ  
 ഇനിയും .....  
 നിയെൻ രക്തം ദുമിക്കു  
 നൽകിയാലുമെൻനറുമണം  
 കാറ്റിൽ പറത്തികളഞ്ഞാലും  
 പീനീക്സ് പക്ഷിയെപോൽ  
 ചിറകുവിടർത്തി പറന്നുയരും  
 ഒടുവിൽ തിനാളത്തിൽ നിന്ന്  
 ജലിച്ചുയരും....  
 എന്നാലല്ലെമർത്യാ നിയുളളു  
 നിനക്കായ് എൻ ജീവിതവും





# Nanotechnology in Catalysis

Catalysis is the acceleration of a chemical reaction by means of a substance, called a catalyst, which is itself not consumed by the overall reaction. It is one of the most valuable principles out of the twelve postulates of Green chemistry. Nanocatalysis is a rapidly growing field which involves the use of nanomaterials as catalysts for a variety of homogeneous and heterogeneous catalysis applications. Nanocatalysts improve the selectivity of the reactions by allowing reaction at a lower temperature, reducing the occurrence of side reactions, higher recycling rates and recovery of energy consumption. Therefore, they are widely used in green chemistry. Nanoscale catalysts have high specific surface area and surface energy, which ultimately lead to the high catalytic activity. Also when materials are fabricated on the nanoscale, they achieve properties not found within their macroscopic counterparts. Both of these reasons account for the versatility and effectiveness of nanocatalysts.

Heterogeneous catalysis represents one of the oldest commercial practices of nanoscience; nanoparticles of metals, semiconductors, oxides, and other compounds have been widely used for important chemical reactions. Nanomaterial-based catalysts are usually heterogeneous catalysts broken up into metal nanoparticles in order to speed up the catalytic process. Metal nanoparticles have a higher surface area so there is increased catalytic activity because more catalytic reactions can occur at the same time. Nanoparticle catalysts can also be easily separated and recycled with more retention of catalytic activity than their bulk counterparts. These catalysts can play two different roles in catalytic processes: they can be the site of catalysis or they can act as a support for catalytic processes. They are typically used under mild conditions to prevent decomposition of the nanoparticles at extreme conditions.

In homogeneous catalysis, transition metal nanoparticles in colloidal solutions are used as catalysts. In this type of catalysis, the colloidal transition metal nanoparticles are finely dispersed in an organic or aqueous solution, or a solvent mixture. The colloidal nanoparticle solutions must be stabilized in order to prevent aggregation of the nanoparticles. Metal colloids are very efficient catalysts because a large number of atoms are present on the surface of the nanoparticles. The method that is used in synthesizing transition metal nanoparticles in colloidal solutions is very important for catalytic applications. The reduction method employed controls the size and the shape of the transition metal nanoparticles that are formed, which are very important in catalytic applications. Chemical reduction of the precursor transition metal salt is the most widely used method of synthesizing transition metal nanocatalysts in colloidal solution. There are other synthetic methods to prepare colloidal transition metal nanocatalysts that are not as commonly used. These synthetic methods include thermal, photochemical, sonochemical reduction of the precursor transition metal salts, metal vapor synthesis and electrochemical reduction. Stabilization of nanoparticles in the solution is necessary in order to prevent agglomeration and aggregation. For catalytic applications, the choice of stabilizers plays an important role in determining the reactivity of nanoparticles.

A good stabilizer is one that protects the nanoparticles during the catalytic process, but does not neutralize the surface of nanoparticles resulting in loss of catalytic activity. The choice of a stabilizer to be used for capping the nanoparticles affects the surface, fraction of available sites for catalysis, the size and shape of the nanoparticles formed. Heterogeneous metal nanocatalysts are prepared by adsorption of nanoparticles on to supports, which involves functionalization of supports to adsorb nanoparticles on to them.

## Benefits of nanocatalysts in chemical industry

- Increased selectivity and activity of catalysts by controlling pore size and particle characteristics
- Replacement of precious metal catalysts by catalysts at the nanoscale and use of base metals, thus improving chemical reactivity and reducing process costs

## Important Applications of Nanocatalysis

- Nano Fe and Co used in green diesel production
- Nano Pd in C-C coupling reactions
- *Nano transition metals in hydrogen production by reaction of ammonia*
- *Nano metallic Ag in water purification*
- *Carbon nanomaterials in drug delivery*

In view of the numerous potential benefits that can be attained through their use, nanostructured catalysts have been the subject of considerable research attention in recent times. A key objective of nanocatalysis research is to produce catalysts with 100% selectivity, extremely high activity, low energy consumption, and long lifetime. This can be achieved only by precisely controlling the size, shape, spatial distribution, surface composition and electronic structure, and thermal and chemical stability of the individual nano component. Nanocatalysis is a growing business and a detailed understanding of chemistry of nanostructures and the ability to control materials on the nanometer scale will ensure a rational and cost efficient development of new and more capable catalysts for a chemical process.

Dr. Jaya T. Varkey  
Assistant Professor, Department of  
Chemistry, St. Teresa's College,  
Ernakulam.



# “FOR THE GREATEST BENEFIT TO MANKIND”

-Alfred Nobel



The history of Nobel prize starts with Alfred Nobel, the renowned scientist who invented dynamite. He made fortune by selling it which was used for making deadly weapons.

In 1888 Alfred's brother Ludwig Nobel passed away. But many newspapers mistakenly thought that Alfred Nobel was dead. Newspapers published obituaries for Nobel. One of them quoted “Le Merchant de la mort” or “The merchant of death is dead”. Alfred read those obituaries and was ashamed of what his legacy has turned out to be.

On 27 November 1895 he signed his last will, where Nobel instructed that most of his fortune must be set aside as a fund for the award of five annual prizes, "to those who, during the preceding years, shall have conferred the greatest benefit on mankind."

Prizes established by his will are the Nobel prize for Physics, Chemistry, Medicine, Literature and Peace. The first distribution of the prizes took place on 10 December 1901, the 5<sup>th</sup> anniversary of Nobel's death. An additional award Sberiges Riks Bank prize in Economics was established in 1968 in memory of Alfred Nobel which was first awarded in 1969.

According to his will, he had stipulated for different institutions- 3 Swedish and 1 Norwegian to award the prizes. From Stockholme, the Royal Swedish Academy of Sciences confers the prizes for Physics, Chemistry and Economics, the Karolinska Institute confers the prize

for Medicine and Swedish Academy confers prize for Literature, the Norwegian Nobel committee based in Oslo confers the prize for peace.

The statutes of Nobel Foundation says

- 1) Prize amounts may be equally divided between two works, each of which is considered to merit a prize. If a work that is being awarded has been produced by two or three persons, the prize shall be awarded to them jointly. In no case may prize amount be divided between more than three people.
- 2) If none of the works under consideration is found to be of the importance, the prize money shall be reserved until the following year. If even then the prize can not be awarded, the amount shall be added to foundation's restricted funds.
- 3) Prize can not be awarded posthumously, unless death has occurred after the announcement of the Nobel prize.

Between 1901 and 2017 the Nobel prizes and the prize in Economic sciences was awarded 585 times.

Nobel Prize	No. of Prizes	No. of Laureates
Physics	111	207
Chemistry	109	178
Medicine	108	214
Literature	110	114
Peace	98	131
Economic sciences	49	79
Total	585	923

## YEARS WITHOUT NOBEL PRIZES

Since the start, in 1901, there are some years when the Nobel Prize has not been awarded. Mostly during World War I and II.

## THE NOBEL PRIZE INSIGNIAS

A Nobel Laureate receives three things: a Nobel diploma, a Nobel medal and a document confirming Nobel Prize amount.

The Nobel Medals in Physics, Chemistry, Medicine and Peace are identical on one face. It shows image of Alfred Nobel and the years of his birth and death. The image on the reverse varies according to the institution awarding the prize.

## WHY NOBEL PRIZE WINNERS ARE CALLED LAUREATES ?

The word 'Laureate' refers to laureal wreath, which is worn by god Appolo. In ancient Greece laureal wreaths made of branches and leaves of the bay laureal were awarded to victors as a sign of honour.

## FEMALE NOBEL LAUREATES IN CHEMISTRY

Of the 168 individuals who received Nobel prize in chemistry, four are women so far. Two of these four women, Marie Curie and Dorothy Crowfoot Hodgkin were awarded with unshared Chemistry prizes.

1911- Marie Curie

1935- Irene Joliot Curie

1964- Dorothy Crowfoot Hodgkin

2009- Ada Yonath

Today the Nobel Prizes are widely regarded as the most prestigious awards given for intellectual achievements in the world.

Akshaya A.S

1<sup>st</sup> MSc Chemistry



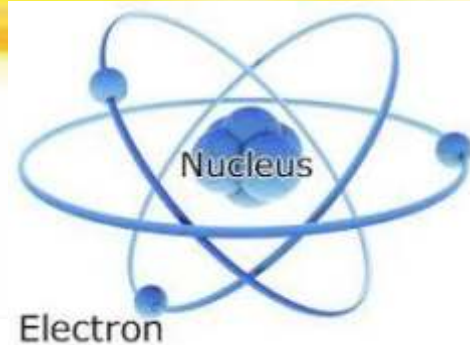
# CROSSWORD

## ACROSS

- 1) Type of compound where elements are gained or lost [5]
- 6) Symbol of Magnesium [2]
- 7) A radioactive metal [7]
- 10) Type of compound where electrons are shared between bonded atoms [6]
- 13) Noble or inert gas used in street signs [4]
- 14) Common salt is Sodium \_\_\_ [8]
- 17) Symbol of Gold [2]
- 18) Positively charged particle of an atom [6]
- 20) Symbol of Mercury [2]
- 21) Ion containing atoms of Hydrogen, Carbon, and Oxygen [11]
- 22) Number of protons in an atom is the \_\_\_ number [6]
- 25) Inert gases are called \_\_\_ gases [5]
- 27) Pure substances containing one type of atom [7]

## DOWN

- 2) Symbol of Sodium [2]
- 3) Pure substances with different types of atoms [8]
- 4) \_\_\_ table of elements [8]
- 5) Particle with no charge in nucleus of atom [7]
- 8) Negatively charged particle of an atom [8]
- 9) Symbol of Zinc [2]
- 11) Maximum number of electrons in first electron level [5]
- 12) Symbol of Helium [2]
- 15) Maximum number of electrons in second electron level [5]
- 16) Cement is Calcium \_\_\_ [9]
- 19) Ti is the symbol for this metal [8]
- 22) Symbol of Silver [2]
- 23) Number of protons and neutrons in an atom is \_\_\_ number [4]
- 24) Symbol of Chlorine [2]
- 26) Symbol of Iron [2]



Hello everyone,  
I'm electron. As you all know we are very small and cute. We are negatively charged but it doesn't mean that we are always gloomy, we are always happy and dancing in our own world. Our style is called by the name "SPIN" which is an international dance form. We belong to a very big family called an ATOM. There are many members in our family including parents and many siblings. Actually our father and mother together forms a beautiful couple and their couple name is NUCLEUS. Our parents share a very good bonding which is unbreakable. Their bonding is greater than any other forces in the universe. Since I'm the smallest child of my parents, they always need me by their side. So I reside in the nearest K room. But my elder ones are always in a party mood, so they reside at N th room. Hence they are out of my parents control, they follows their mind.

II MSc. Students

## ANSWERS:-

### ACROSS:-

1-Ionic, 6-Mg, 7-Uranium, 10-Covalent, 13-Neon, 14-Chloride, 17-Au, 18-Proton, 20-Hg, 21-Bicarbonate, 22-Atomic, 25-Noble, 27-Element

### DOWN:-

2-Na, 3-Compound, 4-Periodic, 5-Neutron, 8-Electron, 9-Zn, 11-Two, 12-He, 15-Eight, 16-Carbonate, 19-Titanium, 22-Ag, 23-Mass, 24-Cl, 26-Fe

