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DMAI Newsletter

The Dyestuffs Manufacturers Association of India

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Convention on Colorants - 2017 (COC 17)

Cover Story



Keynote Speaker lighting the traditional lamp



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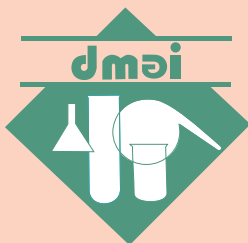
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The Dyestuffs Manufacturers
Association of India

DMAI Newsletter

Published by

S. Balasundaram
Executive Secretary

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Contents

Editorial 3

President's Page 5

Cover Story

Convention on Colorants - 2017 (COC 17) 7

FEATURES

Natural Dyes - Innovation and upgradation of technology use
-Dr. Padma S. Vankar 16

Synthesis Application and Practical Uses of Functional
Metallophthalocyanines
- Nagao Kobayashi..... 20

DMAI News 23

Seminars & Meetings 24

Forthcoming Events 26



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Mr. Ram Ajekar
Honorary Editor



Mr. Virendra Widge



Prof. Vinod Kanetkar



Mr. Vinit Shah



Mr. Sandeep Shah

Dear Readers,

The Union Budget presented on 1st February, 2017 contains several welcome features. An allocation of Rs.1.87 Lakh lac crores was made for rural programs such as housing for rural poor (10 million houses by 2019), electrification, irrigation etc. which will create employment and increase rural incomes. A record total of Rs.3.96 Lakh lacs crores, has been allocated for infrastructure development. A well deserved boost is given to renewable energy which is the need of the hour. Infrastructure status has been accorded to affordable housing enabling this sector to access low cost funds and also get tax incentives. A widely expected reduction in overall corporate tax rate to at least 25% has not been considered. The reduction is restricted to companies with annual turnover upto Rs.50 crores. With expected buoyancy in revenue collection as a result of better tax compliance and economic growth, let us hope the turnover restriction will be removed soon. Tax rate reduction will give a big impetus for the growth of manufacturing sector. In the meanwhile all are advised to study the provisions relating to restriction on cash transactions and follow them strictly. Aadhar number has to be intimated to income tax dept. by 1st July 2017.

According to Dept. of Industrial Policy and Promotion (DIPP) report, foreign direct investment (FDI) grew to \$27.82 billion during April – October 2016 of which manufacturing sector accounted for 41.5% which is noteworthy. Similarly during April-Dec 2016 period FDI rose 22% and is expected to cross FY 2016 mark of \$40 billion in full year. The trend shows investor confidence in the Indian economy helped by the Government's liberalized FDI policy during the last two years. With strong performance in the recently concluded elections in a few states the BJP govt at the centre is expected to accelerate the process of economic reforms in many areas and also ensure policy continuity.

With improvement in the economy of USA & Europe, India's exports rose for six months consecutively in a row and registered an impressive 17.48% growth in Feb 2017, the highest seen in about 5 years. However the rapidly rising Indian currency is a matter of concern for exporters who are likely to be adversely affected at least in the short to medium term. There is a need for caution as there are indications of Rupee gaining further. GDP also grew 7% for December 2016 quarter belying expectations of slower growth due to demonetization. Manufacturing sector also witnessed fairly good growth in February. There is ample scope for GPP growth rate to rise further in the near future.

After lots of uncertainties, the introduction of GST on 1st July, 2017 appears certain. Hopefully there will be a smooth transition to the new regime of taxation which the whole country has been eagerly looking forward to since many years.

The demand for colorants which was very sluggish for the last 5-6 months appears to be reviving though very slowly. As repeatedly mentioned earlier, intermediates manufacturers must maintain price stability at a reasonable level for the steady and long term growth of Colorants industry and also in the interest of consumers of Colorants.

All of us in the Editorial team wish you all a financially much better and more rewarding FY 2017-18.

Ram Ajekar
Honorary Editor

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It is a pleasure to be writing to you all again in this third quarter, after the new DMAI Managing Committee assumed office.

Friends, we are in for a new economic reforms season, as well as some festival times for celebrations. We just celebrated Holi last month along with Gudi Padwa, the traditional Hindu New Year. As you will receive this newsletter in the begging of the Financial Year 2017-18, I take this opportunity to wish you all a very prosperous and happy new year.



Economic Reforms & GST law

The nation is going through revolutionary economic reforms. The demonetization and its impact on payment mechanism are now being followed with a major taxation reform. The GST seems set for implementation from 1st July 2017. We are planning some Programs to familiarize members with the new tax regime, and to provide the accounting staff with some hands on knowledge. The smooth passage of the budget should lead to further reforms. Investment climate is showing improvement, as evident from the sentiments on Stock & Capital Markets.

Environment Protection & Regulations

The changes in policy on the chemicals and pharmaceutical sector impacting various South Gujarat regions were announced last quarter and are now being implemented rigorously. This is an implicit call for serious and very responsible behavior for environment preservation and protection by all of us in industry. As I said last time, and wish to repeat for emphasis, the new freedom must be utilized for better future growth with due care for our environment. We must not take this new freedom for granted and sow seeds to loose it later again.

COC 2017 – Academia Industry partnership flourishes

As expected, we successfully conducted the 7th consecutive Convention on Colorants (COC) in February 2017. The attendance from members was very good in numbers. The participation of students from ICT and other institutions related to Colorants and Textiles industry, with their Poster presentations, added very interesting academic flavor to this event. It has created a good precedent and practice to be followed in future for better Industry & Academia partnership, one of our key objectives for these conventions.

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Convention on Colorants-2017 (COC 17)

The 7th Edition of International Convention on Colorants -2017 was conducted by The Dyestuffs Manufacturers Association of India (DMAI) jointly with the Institute of Chemical Technology (ICT), Mumbai and supported by the Dept. of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt of India on 9-10 February 2017 at The Club, Andheri (W), Mumbai. More than 200 delegates from the industry and academia attended the Convention. Padmashree Prof. Goverdhan Mehta, FNA, FRS University Distinguished Professor & Dr. Kallam Anji Reddy Chair School of Chemistry, University of Hyderabad was the Keynote Speaker.

Plenary Session

During the Plenary Session held on 9th February 2017, Dr. Shavak Bhumgara, Convention Secretary and 2nd Vice President, DMAI anchored the proceedings.



Convention Secretary
Dr. Shavak Bhumgara
anchors the proceedings

At the outset, National Anthem was recited.

In his brief welcome address, Shri Jitendra Patel, Chairman, COC 17 & President, DMAI stated that it is a very happy and pride moment for all of us to attend the 7th edition of COC 17. It was in 2005 when the concept of COC was conceived by the mentors Prof. Kanetkar, the then Head of Dyes Department,



Mr. Jitendra Patel,
Chairman, COC 17
welcomes the gathering

UDCT and Shri Janak Mehta from DMAI and organized the first COC. After having conducted 6 editions of COC, the 7th edition, which is being organized now with the support of Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of

India, will also have a smooth sail, he hoped. He complimented and applauded both mentors Prof. Kanetkar and Shri Janak Mehta.

While welcoming the delegates, Shri Patel was hopeful that the experience and expertise of the distinguished and eminent speakers will undoubtedly enable the participants to acquire updated and immense knowledge for their future endeavours. He also thanked all the Organising Committee members and others behind the show. While concluding his address, Shri Patel thanked the delegates and others, who have attended in large numbers for the event and was confident that the deliberations would be very much useful to them.

The proceedings thereafter started with lighting of the traditional lamp by the dignitaries on the dais. They also released the colourful, attractive and illustrative souvenir of COC 17.

Prof. Ganapati Shankarling, Co-Chairman, COC 17, in his address, welcomed the distinguished audience and was confident that the earlier versions of COCs would have definitely benefited the participants. Poster sessions by the students of ICT and Shroff S.R. Rotary Institute of Chemical Technology (SRICT), Bharuch would be an impetus for them to display their presentations based on their relentless research work.



Prof. Ganapati Shankarling,
Co-Chairman, COC-17
address the audience

While complimenting the Colorant Industry, Academia and the Govt. for this unique venture of coming together under the same umbrella to exchange knowledge, Prof. Shankarling was sanguine that the presentations of the eminent and experienced speakers during the current edition would create a platform for the colorants fraternity to take away new ideas and thoughts.

Prof. Kanetkar, in his address as the Mentor of COCs, identified 3 important characteristics for

conducting the Conventions viz. improvement by way of process intensification, environmental concepts to safeguard the nature and humanity from the ill effects and thrust in Research and Development. These constituted the very nucleus for the past COCs as well as the present one.



Mentor Prof.V.R. Kanetkar in his address

Mentor Shri Janak Mehta, in his brief address, mentioned that the Convention has now crossed national barriers and even reached other parts of Asian Countries and globe. It is now a full-fledged movement, which is very relevant to colorants calendar.



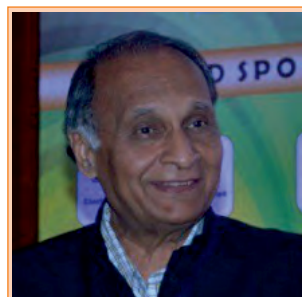
Mentor Mr. Janak Mehta addresses the audience

The research in the organic chemistry all over the world would automatically change the mind-set of the industry, he added. The R part of R&D has played a larger role in this transformation.

The basic concept of COC is to reach the best of research work to the doorstep of colorant industry from anywhere in the world. He complimented the students for the poster session, which was started in 2013 edition, which would display their research work and sharpen their skills. Shri Mehta also thanked the Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, GOI for their active support and co-operation extended to the industry including COCs.

Prof. Prakash Bhathe thereafter introduced the Keynote Speaker Prof. Goverdhan Mehta to the audience.

Padmashree Prof.



Padmashree Prof. Goverdhan delivers the Keynote Address

Goverdhan Mehta began his Keynote Address, titled "Rethinking Chemistry – A Science for Global Sustainability in the 21st Century" by recalling the great services rendered by Prof K Venkataraman Chemistry.

Prof. Mehta kept the audience spellbound during his entire address with his remarkable elaborate, yet very interesting and lucid presentation. Some of the main features of his address are as under:

Stressing the major connection between chemistry and colorants, Prof Mehta outlined chemistry as an omnipresent science, its past, its present and its future as a sustainable science. While quoting simple examples from our daily life, Prof. Mehta brought home that Chemistry is manifest in each human endeavor.

He vividly and exhaustively described the perception of chemistry as a science, which has evolved over time into an integrative science having to emerge as a sustainable one. Expressing concern about ever increasing consumption of scarce national resources which is unsustainable he emphasized the need for chemistry to become greener, leaner and resource prudent. Naming recycling as the most important feature of sustainability, Prof Mehta stressed that the concept of recycling has to become fundamental to the practice of chemistry. He also advised chemists to stop keeping on creating unnecessary molecules and instead concentrate on only what is needed for human advancement and well-being in a risk-free non hazardous way with minimum environmental footprint. He further advised chemists to shun the incrementalistic path in favour of a big leap forward.

Chemistry needs reinvention and repositioning. Prof Mehta predicted that chemistry will be the key factor enabling to provide water, energy, food, health care and shelter to all human beings under the sun. He opined that functional dyes are more efficient means of harnessing solar energy, which is the need of the hour, since they have shown a higher order of efficiency.

Referring to India's commitment at the Paris agreement to provide a carbon sink, Prof. Mehta remarked that recycling of carbon dioxide

is the most feasible solution. He shared a possible ground-breaking advance made very recently by scientists, wherein they have shown the formation of ethanol from carbon dioxide, water and electrons. He also described the process of photosynthesis, wherein the plant kingdom fixes carbon dioxide by utilizing sun's energy. He highlighted the possibility of using the tools of molecular biology to transfer the genetic material from plants to bacteria so that the latter can replicate photosynthesis.

Prof Mehta further emphasized that there is a strong connect between human health and chemistry. Development of newer and better antibiotics by chemists has helped the human race by finding cure for many diseases, including cancer. He highlighted the role of dyes in photodynamic therapy, which is used in some countries for providing palliative care to tumor patients. He mentioned that there are many opportunities for color chemists in these areas.

Prof. Mehta explained in detail the huge contribution of Chemistry in so many areas, but lamented that the chemists do not get the credit they deserve.

The plenary session ended with a vote of thanks by Shri Ram Ajekar, Convener, Finance Committee, COC 17 and Past President, DMAI.

Technical session

In the technical sessions that followed for the next 2 days, many reputed and distinguished speakers from both India and abroad made extensive and informative presentations on the latest technical innovations and up-gradations in the Colorants field all over the globe. Presentations on innovations, focus in areas like Sensors, Process-Safety and Engineering, Process-Intensification, Functional Colorants etc. were well received and appreciated. The topics on which various presentations were made were of high relevance to the Colorant industry and found very useful to the audience.

The Chairmen of Sessions and speakers were felicitated with mementos after each session.



Mr. Ram Ajekar, Convener, Finance Committee, COC 17 proposing vote of thanks

Glimpses of Presentations by Speakers



Mr. V V Bhujle,
GVS Cibatech Pvt Ltd, Mumbai



Mr. K. Sahasranaman,
ex-ThyssenKrupp Industrial Solutions (India) Pvt. Ltd., Mumbai



Prof. A. K. Singh,
Dept. of Chemistry, IIT Bombay



Dr. Peter Czerney,
Founder and M.D.,
Dyomics GmbH, Germany



Dr. M. G. (Deepak) Palekar,
STEP Pvt Ltd, Mumbai



Mr. Syamal De,
Aromatics Division, Atul Ltd



Dr. Padma Vankar,
Principal Research Scientist,
IIT Kanpur



Dr. T. Mukhopadhyay,
Former Executive Director
and R&D Head, Facility for Ecological and
Analytical Testing,
CavinKare Pvt. Ltd., Chennai

Glimpses of Presentations by Speakers



Dr. B. Chakravorty,
M.D., Genesis Membrane
Sepratech Pvt. Ltd. Mumbai



Dr. Vinay Bhandari,
Senior Principal Scientist and Professor,
CSIR-National Chemical Laboratory, Pune



Prof. Nagao Kobayashi,
Shinshu University, Japanex



Mr. Viru Shah,
Air Products and Chemical Inc., USA



Mr. Siddharth Solanki,
Head- Sales, Haver Ibau India Pvt. Ltd.

Poster session

A novel feature which was started in 2013 edition of COC was the Poster Exhibition. There were 31 interesting posters on various innovations by the research students of ICT and other reputed Universities. Top 3 students of poster presentation selected by the Panel of Judges headed by Prof. Kanetkar were awarded cash prizes, which was instituted in 2013 in the memory of Late Dr. Bernt Lamatsch.



Mr. Mekonnen Berhe
(2nd Prize Winner)



Mr. Pratik Hande
(1st Prize Winner)



Mr. Vivek Gajera
(3rd Prize Winner)

Valedictory Session



**Moderator
Mr. Virendra Widge
proposes vote of thanks**

He also proposed a vote of thanks and complimented the teamwork and concerted



Section of Attentive Audience

The concluding session held on 10th February 2017 was moderated by Shri Virendra Widge, Convener, Publicity & Publications Committee.

efforts of all the personnel at different levels as the hallmark for the grand success of COC 17. All the Sponsors and Organising Committee members were also felicitated with mementos.

The curtains were drawn thereafter with cocktails and dinner. Onus is now cast on us for the next COC 19. ■

Presentations at COC 17

Session - I – Process Safety and Engineering

| | Name/Designation/Institution/Company | Topic |
|-----------------|---|---|
| Chairman | Prof. V.R. Kanetkar, Ex-Emeritus Professor, ICT, Mumbai | |
| Speaker | i) Mr. V V Bhujle, Partner, GVS Cibatech Pvt Ltd, | A systematic approach to inherent safety during manufacturing |
| | ii) Mr. K. Sahasranaman, Ex-ThyssenKrupa Industrial Solutions (India) Pvt. Ltd | Utilities in Chemical Process Plant |

Session II - Sensors

| | Name/Designation/Institution/Company | Topic |
|-----------------|--|---|
| Chairman | Prof. N. Sekar, Full Professor & Former head, Dept. of Dyestuff Technology, ICT, Mumbai | |
| Speaker | i) Prof. A.K. Singh, Dept. of Chemistry, IIT Bombay | Design of Fluorescent Molecular probes for various applications |
| | ii) Dr. Peter Czerney, Founder and M.D. Dyomics GmbH, Germany | Applications of Organic Dyes in Life Science Industries |

Session III - Process Intensification

| | Name/Designation/Institution/Company | Topic |
|-----------------|--|---|
| Chairman | Dr. Pankaj Desai, Head, Research & Development, Colourtex Industries Pvt. Ltd. | |
| Speaker | i) Dr. M.G. (Deepak) Palekar, STEP Pvt. Ltd., Mumbai | Technologies for sustainable development in specialty chemical industry |
| | ii) Mr. Syamal Kumar De, General Manager (Technology and Operations) Atul Aromatics | Sulphonation of Aromatics with Sulphur Trioxide |



| Session IV – Natural Dyes | | |
|--|--|---|
| | Name/Designation/Institution/Company | Topic |
| Chairman | <i>Prof.G.S. Shankarling, Head, Dept.of Dyestuff Technology, ICT, Mumbai</i> | |
| Speaker | I Dr.Padma Vankar, Principal Research Scientist, Facility for Ecology and Analytical Testing, IIT Kanpur | Natural Dyes – Innovation and Upgradation of Technology for Industrial Use |
| | ii) Dr.T. Mukhopadhyay, Former Executive Director & R&D Head, Cavinkare Pvt.Ltd, Chennai | Colouring your hair : A Continuing Challenge |
| Session V – Latest Methods in Waste Water Treatment | | |
| | Name/Designation/Institution/Company | Topic |
| Chairman | <i>Mr. Ashok Panjwani, Bharuch Enviro Infrastructure Ltd</i> | |
| Speaker | i) Dr.B. Chakravorty, MD, Genesis Membrane Sepratech Pvt.Ltd., Mumbai | Membrane Technology for Waste Water Treatment |
| | ii) Dr. Vinay Bhandari, Sr. Principal Scientist & Professor, AcSIR, CSIR- National Chemical Laboratory, Pune | Newer Development and Challenges in Dye Wastewater Treatment |
| Session VI – Functional Colorants | | |
| | Name/Designation/Institution/Company | Topic |
| Chairman | <i>Prof. P.M. Bhate, Professor, Dept. of Dyestuff Technology, ICT, Mumbai</i> | |
| Speaker | ii) Prof. Nagao Kobayashi, Shinshu University, Japan | Synthesis, applications and practical uses of functional metallophthalocyanines |
| Session VII – Process Technology | | |
| | Name/Designation/Institution/Company | Topic |
| Chairman | <i>Dr.Shavak Bhumgara Eskay Dyestuffs & Organics Chemicals Pvt.Ltd</i> | |
| Speaker | i) Mr.Viru Shah, ex – Air Products and Chemical Inc., USA | Surfactants, Grind Aids and Defoamers in waterborne Application |
| | ii) Mr. Siddharth Solanki, Head – Sales Haverlbaui India Pvt.Ltd | Powder Filling – Challenges and Solutions |

Poster Session

1. **Energy efficient, clean and photochemical benzylic Bromination using NBS in concentrated solar radiation (CSR)-Prashant V. Ghorpade**, Saurabh Deshpande, Balu Gadilohar, Yogesh Shinde, Deepak Pinjari, Aniruddha Pandit, Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
2. **Reversible 'turn off' fluorescence response of Cu²⁺ ions towards imidazolylpyridinylquinoline based chemosensor with visible colour change- Mr. Shailesh N. Vajekar**, Priyanka A. More, Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
3. **A novel reactive dyeing system based on diazonium salts-Rajaram Dugane^a**, Pratik Hande.a, Prof. Prakash M. Bhate a,* *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
4. **Methoxy supported, deep red emitting mono, bis and tris(triphenylamine-isophorone based styryl colorants: Synthesis, photo physical properties, ICT, TICT emission and viscosity sensitivity.-Santosh Katariya**, Shantaram Kothavale, Prof. Nagaiyan Sekar*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
5. **Novel pyrazino-phenanthroline based rigid donor- π -acceptor compounds: A detail study of optical properties, acidochromism, solvatochromism and structure-property relationship.-Siddheshwar D. Jadhav**, Shantaram S. Kothawale, Prof. Nagaiyan Sekar *, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
6. **A new type of triphenylamine based coumarin-rhodamine hybrid compounds: Synthesis, Photophysical properties, viscosity sensitivity and energy transfer**-Shantaram Kothavale and Prof. Nagaiyan Sekar*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
7. **Dihydroquinazolinone based "turn-off" fluorescence sensor for detection of Cu²⁺ ions-Pravin N. Borase**, Pranila B. Thale and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
8. **Photoswitchable conjugated assembly involving Fluorescent Boranil- Saurabh Deshpande**, Haribhau Kumbhar, Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
9. **Synthesis and photo-physical study of novel two donor one acceptor coumarin based styryl colorants- Eknath M. Gayakwad**, Vilas V. Patil, and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
10. **An effect of H-bonding in synthesis of 1, 5-diketones via Tandem Aldol-Michael addition reaction using room temperature ionic liquid (RTIL).-Sujit S. Kamble^a** and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
11. **Synthesis of Copper Phthalocyanine using Deep Eutectic Solvent- Amruta Joglekar^a**, and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
12. **Novel symmetrical squaraines based on 2, 3, 3-trimethyl-3H- pyrrolo [2, 3- f] quinoline: Synthesis, Photophysical properties and application as Cu²⁺ sensor.- Sushil Khopkar**, and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
13. **Aggregation induced emission (AIE) active carbazolestyryl fluorescent molecular**

rotor as viscosity sensor-Viral Mehata, Haribhau S. Kumbhar, Saurabh S. Deshpande, and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*

14. **4-methyl-2H,5H-pyrano based 2-hydroxy-4H-pyrido[1,2-a]pyrimidin-4-one fluorescent brightening agents- synthesis, photophysical properties and dyeing studies- Yogesh Gawale**, Prof. Nagaiyan Sekar*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
15. **Red emitting triphenylamine based rhodamine analogous with enhanced Stokes shift and viscosity sensitive emission- Amol G. Jadhav**, Shantaram Kothavale, Prof. Nagaiyan Sekar*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
16. **Degradation of recalcitrant dyes using greener and effective techniques.- Mimoh Kolia, Karishma Shah^a** and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
17. **Choline Chloride based deep eutectic solvents improved polyester dyeing, for process optimization and green approach- Mekonnen H. Berhe** and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
18. **Synthesis of azo disperse dyes using oxone in deep eutectic solvent- Rishikant K. Sonune**, Mekonnen H. Berhe, and Prof. Ganapati S. Shankarling*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
19. **Graphene Derivative As a Highly Efficient Nitrosonium Source: A Reusable Catalyst for Diazotization and Coupling Reaction- Dattatray A. Pethsangave^a**, Rahul V. Khose, Pravin H. Wadekara, Surajit Somea*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
20. **A novel reactive dyeing system based on diazonium salts – evidence of dye-cellulose covalent bond.- Pratik Hande^a**, Prof. Prakash M. Bhate a,* *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
21. **Benzophenone based fluorophore for selective detection of Sn²⁺ ion: Experimental and theoretical study- Suvidha S. Shinde**, Amol Jadhav, Sandip Lanke, Prof. Nagaiyan Sekar*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India*
22. **PET governed Fluorescence “Turn On” BODIPY probe for selective detection of picric acid- Sagar Yadav**, Prof. Nagaiyan Sekar*, *Department of Dyestuff Technology, Institute of Chemical Technology, Mumbai, India.*
23. **Studies on dyeing of cotton using reactive dyes by different commercially important techniques-Rohit Kumar Girase**, Dr. V.G. Nadiger, Karan Chandrakar, A.M. Daberao, P.P. Raichurkar, *Centre for Textile Function, MPSTME, NMIMS, Karvand Naka, Shirpur, Maharashtra-India.*
24. **Effect of Time on shade variation- Neha Patil**, Dr. V.G. Nadiger, T.A. Shinde, P. P. Raichurkar, *Centre for Textile Function, MPSTME, NMIMS, Karvand Naka, Shirpur, Maharashtra-India.*
25. **Effect of salts on reactive dyeing on knitted fabrics-Sambhaji Patil**, Dr. V.G. Nadiger, Karan Chandrakar, A.M. Daberao, P.P. Raichurkar, *Centre for Textile Function, MPSTME, NMIMS, Karvand Naka, Shirpur, Maharashtra-India.*
26. **Novel approach of coalesced composite of Calcium carbonate and TiO₂ pigment preparation and its applications.- Sunil M. Patel^a**, Karan M. Choksi^a, Balwinder S. Singh^a, Ashvin G. Bavaskar^a & N. P. Badgujar^b, *Department of Dyes & Pigment Technology, Shroff S.R Rotary Institute of Chemical Technology, Ankleshwar, Gujarat, India*
27. **Synthesis of Cost effective Iron Phthalocyanine pigment and its application.- Kuldeep P. Jawale^a**, Mukesh Yadav, Miteshji Rajput and N. P. Badgujar^b, *Department of*



Dyes & Pigment Technology, Shroff S. R. Rotary Institute of Chemical Technology, Ankleshwar, Gujarat, India

- 28. Synthesis of Monoazo disperse dyes based on thiazole derivative and their dyeing performance on polyester fibres- Akshay A. Patel^a**, Mihir M. Patela, KuldeepYadava&Anant B. Desai^b, *Department of Dyes & Pigment Technology, Shroff S. R. Rotary Institute of Chemical Technology, Ankleshwar, Gujarat, India*
- 29. Synthesis of disperse dyes based on 2-pyridone and its application on polyester fabric.-Vivek H. Gajera^a**, Ajay J. Borkhatriya^a, Pravin R. Khernar^a, Anant B. Desai^b, *Department of Dyes & Pigment Technology, Shroff S. R. Rotary Institute of Chjamemical Technology, Ankleshwar, Gujarat, India*
- 30. To reduce chemical consumption in pre-treatment process of terry towel- KiranPatil**, T.A. Shinde, P. P.Raichurkar, *Centre for Textile Function, MPSTME, NMIMS, Karvand Naka, Shirpur, Maharashtra-India*
- 31. To optimize exhaustion and maximize fixation of reactive dyes- Swati R. Koli**, T.A. Shinde, P.P.Raichurkar, *Centre for Textile Function, MPSTME, NMIMS, Karvand Naka, Shirpur, Maharashtra-India.*

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APPEAL

A strong membership base the strength of any associations, helps in commanding due respect and attention, enabling the association to take up industry problem effectively with the concerned authorities it helps the Industry to face the problem unitedly, and to work for its betterment. We therefore appeal to you to introduce new members to the Association.

Natural dyes - Innovation and upgradation of technology use



Dr. Padma S. Vankar
Ph.D. IIT Kanpur

The journey of working in the area of natural dyeing started way back in 1997 when the German Ban on Azao dyes was announced and soon after that the Indian Ban was implemented too. While trying to understand the process of natural dyeing and its lost galore it was important to understand what caused the failure. Thus it was imperative to have a good understanding of the challenges in Natural dyeing. The four main challenges in natural dyeing are

- Dye extraction efficiently
- Preparation of Standardize dye extract
- Best wash and light fastnesses of the dyed fabrics. Lot of research has gone into this effort as the commercial market seeks best dyed fabric in all textile materials.
- Increase the dye adherence and how to retain the dye on the fabric are the main issues that need to be addressed in order to improve the fastness properties.

Once this was understood properly we started working scientifically in the areas of challenges – and the Innovations which was done were in the areas of: Improved extraction procedure, Less use of Metal Mordants, Introduction of use of Enzymes in dyeing, Use of Bio-mordants, Innovative Method for dyeing and Optimization of the dyeing procedures

Among the prevalent dye extraction methods:

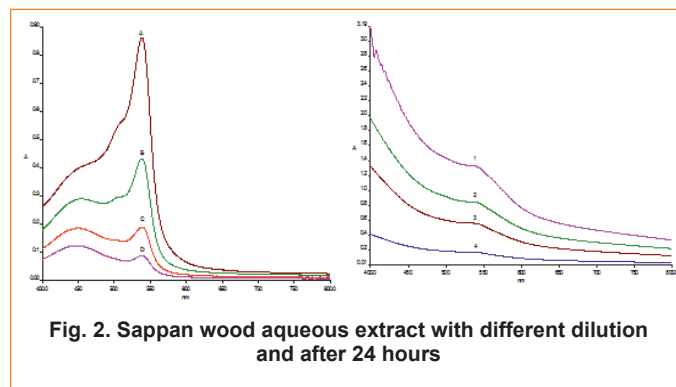
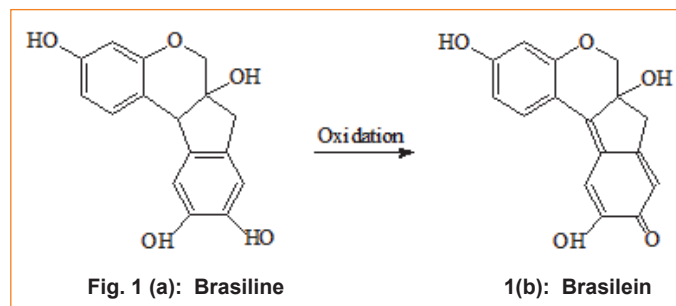
- Soxhlet
- Conventional Boiling

Both these methods required long heating time which often would result in degradation of the colorant molecule irreversibly. Effective method for Extraction of dyes from plant: Efficient extraction of the dye from the plant material is very important for obtaining standardization and optimization of natural dyes. This could be done by utilizing two modern methods:

- Sonicator methods
- Supercritical extraction.

Dye extraction efficiency could be enhanced by the following method Some of them are mentioned differing from plant to plant. Sonication extraction was carried out in the case of Sappan wood, as the magenta color of the dye got irreversibly changed to brown on heating.

The brasiline molecule changed to brasilein. This prompted us to use sonicator for the extraction of dye and then use the same extract for dyeing(1). Figure 1 and 2 show the structures and mode of deterioration of the sappan wood dye extract on exposure to air in 24 hours.



Specialized techniques of dye extraction were practiced for different plant materials. Cold and hot water extraction- was used for Hibiscus flower, Methanol/water extraction was used for Tegetus flower and Acidic/Alkaline extraction for used for Plumeria flower.

Started Hunting for Standards for ND

In order to prepare standardized natural dyes, started hunting for standards: There was none available in any of the global standard organizations such as:

- ASTM—American Standards

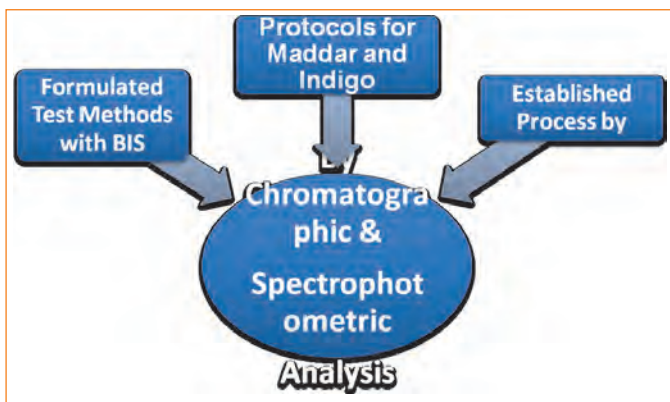
- AFNOR-French Standards
- DIN--Deutsches Institut für Normung
- AENOR– Spanish Standards
- BSI--British Standards
- BIS– Bureau of Indian Standards

No method for testing natural dyes was available in any of the above mentioned standards

The idea of making testing protocols for Natural Dyes occurred to us . Being in FEAT laboratory and working as Analytical chemist, started making our own testing protocols for Natural dyes

- Identification of Natural dye on the basis of its structure through spectroscopic methods
- Looking for adulterant(usually a very serious problem with high priced ND) by chromatographic methods

Since “NO TEST METHODS FOR NATURAL DYES ARE AVAILABLE SO FAR” So we.....



A simple method that we found which had wide applicability in Identification of Natural dyes was UV-Visible spectroscopic method, it also seem to be a diagnostic method. We took samples to Rubia cordifolia Rc(Indian Madder) , Rubia tinctoria (Rt)and Alizarin (Al). The three samples show very distinctive spots under different wavelength figure 3 (254 nm) and figure 4 (366 nm) showing the clear presence of Alizarin in Rt and almost nilin Rc.

UV-VIS Method

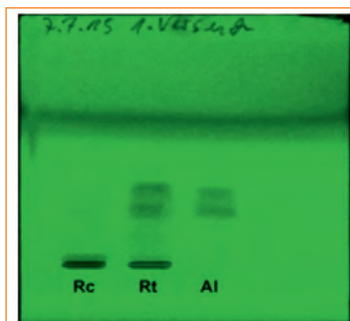


Fig. 3: taken at 254 nm

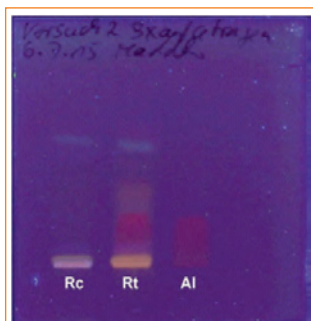


Fig. 4: taken at 366 nm

While working with Natural dyes the drawback faced are the following:

- Color fastness issues- wash and Light fastnesses
- Shade matching issues
- Batch to batch differences in color
- Shelf life issues
- Sourcing issues

How does one then work towards betterment of Wash and Light fastnesses

- Keeping in mind the ecofriendliness of any new reagent and its compatibility with Natural dyes, a lot of chemistry can be applied to enhance the wash and lightness properties of naturally dyed fabrics.
- Use of Biomordants, Enzyme, Chitosan and by physical methods using different natural dyes helped us to overcome this hurdle.

We also looked at the role of Textile process enhancers

Textile process enhancers improve performance during the textile treatment process. A fixation of natural dye helps to retain the dye on the fabric as these dye fixing agents help in wet and dry process and often enhance light fastness properties of textiles as well. They also work to avoid shade change and bleeding of dyes especially during the first wash.

Role of Industrial Salts

In the textile industry, industrial salt is used in the dyeing process of fabrics and materials, such as for dyeing cotton and silk. When used in a dye bath, salt causes the dye to completely penetrate into the fabric, thereby making the dyeing process easier.

Two types of industrial salt for textile dyeing are commonly used: vacuum and rock salt. Both types of salt have a very high sodium chloride content and are available in different grain sizes. This dye-fix is very safe and readily available.

Mandatory Use of Metal mordants in Natural dyeing

As natural dyeing has been mostly carried out with the help of metal mordants .Use of Aluminium, Ferrous, Copper, Stannic, chromium salts have been prevalent. The last three metal salts are toxic cannot be recommended for industrial use. Waste water management would be a major problem.

Role of metal in natural dyeing

Since the metal plays a role as bridging head between the fabric and the dye molecule it has a very vital role in dye adherence to the fabric, particularly in the case of Cotton. Silk and Wool being proteinaous also need metal for binding.Either a one step mordant+dye-Simultaneous Method. Two step Mordanting and Dyeing method could be adapted

Use of Biomordants

We used biomordants instead of metal mordants

A plant extract (*Eurya acuminate*) which has inherent metal such as Aluminium or any transition metal can be used along with natural dyeing plant and co-extracted.

This helped us to completely eliminate metal mordanting step in Natural dyeing process at the same time we got very good wash and light fastnesses for the dyed fabrics (2).

When AAS analysis of the plant extracts were carried out-The extract of *Eurya acuminata* DC. var *euprista* Karth. Leaves is found to contain substantial amount of Al. Al accumulation is a primitive character mainly characteristic of woody and tropical representatives of fairly advanced families (e.g. Anisophylleaceae, Hydrangeaceae, Melastomataceae, Rubiaceae, Theaceae, Symplocaceae, Vochysiaceae). Atomic Absorption spectroscopic analysis (GBC Avanta, model-Sigma, Australia) of *Eurya acuminata* leaves extract showed 11.767 mg/L of Al content. A similar analysis was carried out for *Pyrus pashia* fruits (belongs to Rosaceae family) showed presence of copper metal -0.042 mg/L, this prompted us to use *Pyrus* as biomordant.

Use of Enzyme

We were the first ones to use several enzymes in natural dyeing process. The compatibility of each natural dye to different enzymes is like a lock and key matching factor, however the results are very good in terms of wash and light fastnesses of the dyed fabric(3,4and 5).

Use of Reagents from natural origin such as Chitosan

Fugitive natural dye such as Curcuma has very poor wash and light fastnesses, however the availability and the hue color of curcuma always attracts the dyer. Combining with chitosan made the same dye have very improved wash and light fastnesses (6).As shown in figure 5,the pretreated and simultaneous treated cotton and silk show good brilliant yellow colored swatches.

Simple innovations like use of Soda ash with Curcuma made a substantial difference. Brilliant colors in the shade of Orange to deep red could be attained with Curcuma

dye. The combination had good color adherence on fabric.Improved fastness was also attained by this simple treatment. But the radiant yellow color was lost and turned into shades of orange and red as shown in figure-6.

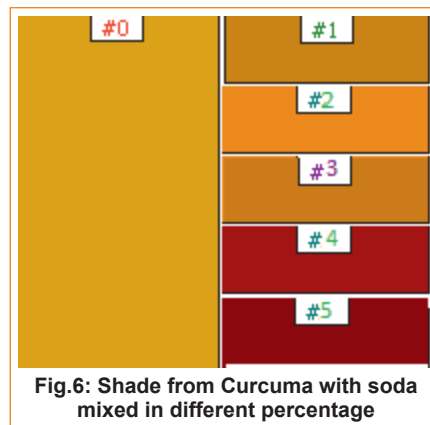


Fig.6: Shade from Curcuma with soda mixed in different percentage

Innovation in Dyeing method

Sonicator dyeing

Sonochemical activity arises mainly from acoustic cavitation in liquid media. The acoustic cavitation occurring near a solid surface of the fabric will generate microjets. The microjet effect facilitate the liquid to move with a high velocity caused increased diffusion of solute inside the pores of the fabric. In the fabric, localised temperature raise and swelling effects due to ultrasound may improve the diffusion. There is an acoustic streaming effect associated with the stable cavitation responsible for the enhanced molecular motion and stirring effect of ultrasound. Stirring action also reduces the concentration gradient in the immediate neighborhood (7). This makes sonicator superior to conventional dyeing techniques. It is heat saving, time saving and energy saving dyeing method and can be up-scaled for industrial purposes.

Microwave dyeing

Microwave dyeing is a method of dyeing small amounts of fabric in the microwave using 'Natural dyes'. It takes into account only the dielectric and the thermal properties. The dielectric property refers to the intrinsic electrical properties that affect the dyeing by dipolar rotation of the dye and influences the microwave field upon the dipoles. The aqueous solution of natural dye extract has two components which are polar, in the high frequency microwave field oscillating at 2450MHz. It influences the vibrational energy in the water molecules and the natural dye molecules. The heating mechanism is through ionic conduction, which is a type of resistance heating. Depending on the acceleration of the ions through the dye solution, it results in collision of dye molecules with the molecules of the fiber. The mordant helps and affects the penetration of the dye and also the depth to which the penetration takes place in the fabric. This makes microwave superior to conventional dyeing techniques. The time required for dyeing is only 5-10 mins, however it is not very feasible for industrial purposes (8).

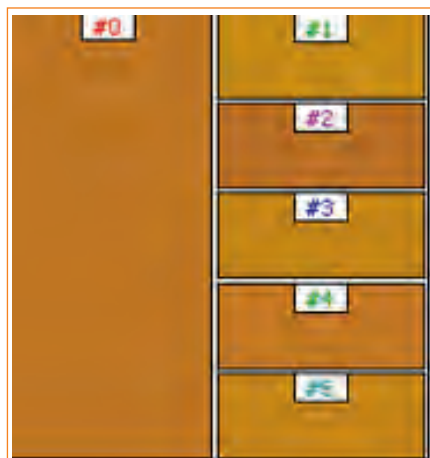


Fig. 5: Sample # 0- Control Cotton, 1- Control Silk, 2-Pretreated Cotton, 3-Pretreated Silk, 4-Simultaneous treated Cotton and 5- Simultaneous treated Silk



Room Temperature Dyeing

This a new technique developed by us and has been demonstrated at several dyehouses in India and Srilanka where cotton, silk and hosiery materials have been shown to be dyed by natural dyes very efficiently at room temperature (30-40 degrees), The dyed fabric showed good wash and light fastnesses and efficient dye uptake even at low temperatures (9).

Quality Standards for Natural dye

Quality standards for natural dyes vary widely, so it is necessary to first take a UV spectral scan of the dye extract. The problem arises with standardization of the colors as no two dye lots are identical and this lack of consistency which leads to repeatability problems. For attempting repeatability of shades for textile dyeing the recommended procedure should be followed strictly and it should be always practiced in the following :

- Use only S.S. Dye-bath
- Water hardness should not be more than 300 ppm.
- Fabric: water ratio should be 1:20

Natural dyes are back in vogue and there is a whole gamut of colors now available in Natural dyes.

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Dr. Vankar completed her B.Sc. and M.Sc. in Chemistry from Christ Church College, Kanpur and earned her Ph.D. from IIT-Kanpur in 1987. She continued with the Chemistry Department at IIT-Kanpur as Research Associate and then proceeded for a one-year post-doctoral stint with Prof. R. R. Schmidt at University of Konstanz, Germany in 1990-91. She returned to IIT-Kanpur and was Senior Project Scientist in the Chemistry Department. She moved to the Facility for Ecological and Analytical Testing at IIT-Kanpur in 1996 and from 2005 to 2012 was Principal Research Scientist there. She is presently Consultant at IIT-Kanpur.

During her long association with IIT-Kanpur, Dr. Vankar developed protocols for testing of natural dyes by using analytical techniques such as HPLC, TLC, FT-IR, UV-Vis, Mass, NMR. She has also developed several agri-based technologies which are ready for commercialization. She has taught a number of courses in analytical chemistry. Dr. Vankar has successfully completed over 25 research projects. She has supervised 5 Ph.D. candidates, 21 M.Sc. candidates and 8 M. Phil. Candidates.

Dr. Vankar has written five books on natural dyes and contributed a chapter in four, produced three documentary films and has two patents to her credit. She has published over 80 research papers in reputed journals.

Synthesis, Applications and Practical Uses of Functional Metallophthalocyanines



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Abstract

Iron and cobalt phthalocyanines (Pcs) containing four or eight carboxyl groups on the periphery have been synthesized and their properties – deodorant, anti-virus and wrinkle-removing functions – were elucidated. These functions are ascribed to oxidative decomposition of organic molecules by atmospheric oxygen activated by the catalytic action of these Pcs. Environmentally harmful halogenated phenols were also decomposed effectively by using these Pcs as catalysts. Photodynamic therapy by using aluminium, zinc, silicon, and magnesium Pcs as photosensitizers is also described.

Introduction

Phthalocyanines (Pcs) have been widely used in society for almost 90 years, and the number of papers and patents has exceeded 2000/year in the 21st century. Japan is considered to be one of the most developed countries in the application of Pcs, with a yearly production of around 15000 tons (global yearly production is more than 50000 tons). Pcs have been applied in the following fields: dyes and pigments (CuPc), charge generation materials in xerography (CuPc), catalysts for sulfur-removing processes in the fuel industry (CoPc), photodynamic reagents for cancer therapy (Al-, Zn-, and SiPcs), optical computer read/write discs (CuPc), deodorants (Fe- and CoPcs), germicides and anti-bacterial reagents (FePc), and growth promotion and retardation reagents for plants (CuPc). Other research fields of interest include chemical sensors, conductors, electrocatalysis, electrophotography, Langmuir-Brodgett films, liquid crystals, non-linear optics, one dimensional metals, photovoltaic cell elements for electricity generation, and semiconductors. We have found that iron and cobalt Pcs having carboxy groups as substituents exhibit high catalytic activity which is based on the activation of atmospheric oxygen. This paper describes the synthesis and activities of these compounds.

Synthesis of iron or cobalt Pcs containing four or eight carboxyl groups (abbreviated as MtPc(COOH)₄ and MtPc(COOH)₈, respectively, where Mt = Fe or Co).

MtPc(COOH)₄ was synthesized from trimellitic anhydride, excess urea, and Fe or Co salts, by heating at around 190°C in solvents such as nitrobenzene and tetraethyleneglycol for about an hour in the presence of ammonium molybdate as catalyst. The resulting Pcs with four carboxyamides were hydrolyzed with strong NaOH solution followed by acidification with conc HCl.

MtPc(COOH)₈ were similarly obtained by using pyromellitic dianhydride. Yields were 20~30% for both MtPc(COOH)₈ and MtPc(COOH)₄, but in particular, the yield of MtPc(COOH)₈ found to decrease if the hydrolysis time was long.

Catalytic activity of Fe and CoPcs containing carboxyl groups

- Oxidation of thiols.** In order to check the catalytic activity of Fe and CoPcs containing four or eight carboxyl groups, oxidation of cysteine and 2-mercaptoethanol (RSH) were studied under aerobic conditions. First RS⁻, which is formed by dissociation of RSH in aqueous solution coordinates to MtPc from one axial coordination site, and then O₂ coordinates from the opposite coordination site, to form a ternary complex consisting of MtPc, RS⁻, and O₂. An electron transfer from RS⁻ to O₂ via the central metal ion occurs, resulting in the formation of the thiol radical RS[•] and superoxide ion. Finally, the reaction of RS⁻ and superoxide ion produces RS[•] and O₂²⁻. The former yields the final product RSSR by coupling with RS[•] (oxidase-like reaction), while the latter decomposes to O₂ and H₂O (catalase-like reaction). Catalytic activity decreased in the order of CoPc(COOH)₈ > FePc(COOH)₈ > CoPc(COOH)₄ ~ FePc(COOH)₄.
- Oxidation of guaiacol.** Peroxidases widely distributed in nature are heme enzymes that catalyze the oxidation of proton donors with H₂O₂. Peroxidase-like oxidation of guaiacol with O₂ or H₂O₂ was studied by FePc(COOH)₈. Both guaiacol and OOH⁻ coordinate to the central metal from axial positions, and an electron transfer occurs from guaiacol to OOH⁻, producing a dimeric product of guaiacol and H₂O and O₂. The dimeric product of guaiacol is identical to the product

obtained by using horseradish peroxidase. The maximum rate of oxidation is increased by about 1000 times in the presence of.

- c) **Decomposition of H₂O₂.** The decomposition of H₂O₂ was examined by using Fe- and CoPc(COOH)_{4,8} as catalysts, and compared to the results obtained in the presence of hemin. The observed turnover values (min⁻¹) of the rate-determination step (k) for hemin, CoPc(COOH)₈, FePc(COOH)₄ and FePc(COOH)₈ were 6, 7, 19, and 160, respectively, in aqueous solution at pH 7. Thus, k for FePc(COOH)₈ is about 26 times that of natural hemin.

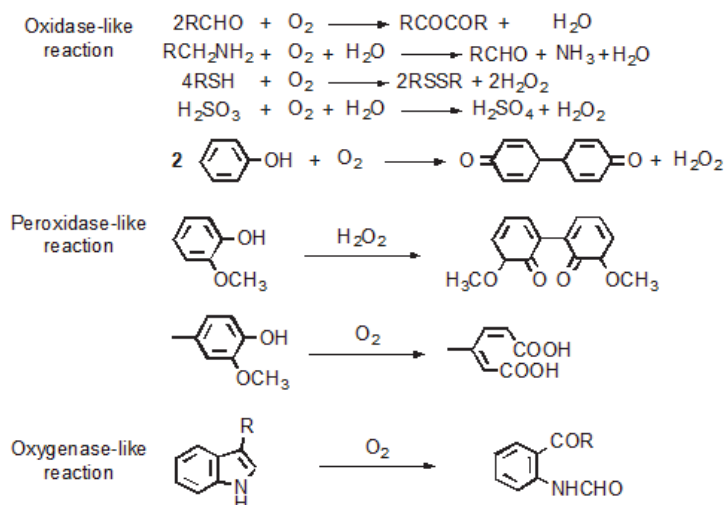
Application of Enzyme-like oxidation by Fe- and CoPc(COOH)_{4,8}

- a) **Application to odor-removing system.** As exemplified above, Fe- and CoPc(COOH)_{4,8} can be used as catalysts for the oxidation of organic molecules. Accordingly, odor-removing substances were prepared by supporting these Pcs on various supports such as silica, alumina, zeolite, active carbon, fiber, paper, film, and plastic. Fibers, particularly natural fibers such as cellulose, are very suitable since they have large surface area per volume. They also contain sufficient amounts of reactive groups and hydrophilic functional groups to support MtPcs. Pcs were supported on fibers by direct dyeing and resin finishing process. Table 1 shows the results of enzyme-like reactions for the decomposition of typical offensive molecules carried out by using these MtPcs supported on fibers. Figure 1 summarizes the removal of foul-odor gases collected from the atmosphere at a sewage treatment plant by FePc(COOH)₈ supported on rayon fiber. The rayon staple fiber containing FePc(COOH)₈ was packed into an acrylic cylinder with 20 mm inner diameter and 110 mm length, and natural foul-odor gas was injected at a slow rate of

100 ml/min. After passing through the cylinder, the gas concentration was determined by gas chromatography. More than 90% of H₂S, CH₃SH, and NH₃ gases were removed by the treatment with FePc(COOH)₈ supported on rayon fiber. The removal capacities of bad-odor gases, including N(CH₃)₃, skatole, and formaldehyde, in addition to the above gases, were measured by the flow method, and compared with those of active carbon in the same volume. The eliminated amounts of bad-smelling substances by using FePc(COOH)₈ supported on rayon fiber was 20-130 times that obtained for the same amount of activated carbon (Fig. 2). Since the results were so good, this FePc(COOH)₈ within a fiber matrix was applied to the development of a new type of odor-remover for use in mattresses, quilts, blankets, wad woven and non-woven materials including bedding, interior goods, toilet articles, nursing goods, clothes, and electronic products. For example, senior citizen patients dealing with an unpleasant smell said, after two weeks of using a Japanese quilt and mattress, "we almost didn't feel uncomfortable". A new pad for urinary incontinence was also designed by using FePc(COOH)₈-supported rayon fiber. For most of the patients, the pad reduced the sensation of dampness. Furthermore, about 70% of the patients reported a reduction of offensive smells from urine and feces. Air filters which remove the toxic odorous substances from smoking and other causes in cabins were also developed (fibers dyed with FePc(COOH)_{4,8}). The filters were mounted on all cars in Japanese bullet trains. The filters of Japanese electric cleaners often contain these fibers.

- b) **Application to bactericidal systems.** Bactericidal activity of radical species in a biological system is generated by the reaction of iron compounds in human red blood cells in the presence of the lipid hydroperoxide. Accordingly, the bactericidal action of FePc(COOH)₈ was also investigated by using tert-butylhydroxide (tert-BuOOH) instead of lipid hydroperoxide. Tert-BuOOH is an oxygen supplier. Table 2 shows strong bactericidal activities against various bacteria observed in the reaction system. Although we need a high level of [tert-BuOOH] to kill bacteria in the absence of FePc(COOH)₈, bacteria were killed effectively in the presence of low levels of [FePc(COOH)₈].

Table 1: Enzyme-Like Reaction for Decomposition of Typical Offensive Molecules



Since good bactericidal activity was observed, we applied FePc(COOH)_{4,8} to masks (anti-viral mask, virus titer (EID₅₀/0.2 ml)), and checked their ability against thuman (A/Aichi/2/68, H3N2) and avian (A/whistling swan/Shimane/499/83, H5N3) influenza virus (tested by the Avian Influenza Center of Kyoto Sangyo University). Initially, the number of human influenza virus was 106.25 while 10 minutes later, it was less than 10 (inactivation score = 99.999%). In contrast, when masks without FePc(COOH)₈



Table 2: Bactericidal effect induced by reaction of tert-BuOOH and FePc(COOH)₈ against various bacteria tert-BuOOH (mM)

| Bacteria | FePc(COOH) ₈ | (mM) | 0 | 0.39 | 0.78 | 1.6 | 3.9 | 7.8 | 16 |
|----------------------|-------------------------|------|------|------|------|-----|-----|-----|----|
| E. Coli | 0 | - | - | - | - | - | - | + | - |
| | 10 | - | + | - | 2+ | 3+ | 3+ | 3+ | 3+ |
| | 20 | - | 2+ | 2~ | 3+ | 3+ | 3+ | 3+ | 3+ |
| S. aureus | 0 | - | - | - | +- | +- | +- | +- | +- |
| | 10 | +- | + | + | + | 2+ | 2~ | 3+ | 3+ |
| | 20 | +- | + | + | 2+ | 3+ | 3+ | 3+ | 3+ |
| S. aureus (MRSA-41) | 0 | - | - | - | - | - | - | +- | +- |
| | 10 | +- | + | 3+ | 3+ | 3+ | 3+ | 3+ | 3+ |
| | 20 | +- | +- | 2+ | 3+ | 3+ | 3+ | 3+ | 3+ |
| S. aureus (MRSA-165) | 0 | - | - | - | - | - | - | - | +- |
| | 10 | - | + | + | + | + | + | 3+ | 3+ |
| P. aeruginosa-55 | 0 | - | - | - | - | - | +- | - | - |
| | 10 | +- | + | 2+ | 2~3+ | 3+ | 3+ | 3+ | 3+ |
| | 20 | +- | 1~2+ | 3+ | 3+ | 3+ | 3+ | 3+ | 3+ |
| P. aeruginosa | 0 | - | - | - | - | - | - | - | +- |
| | 10 | +- | + | + | + | 2+ | 3+ | 3+ | 3+ |
| | 20 | +- | + | + | 2+ | 3+ | 3+ | 3+ | 3+ |
| C. albicans | 0 | - | - | +- | +- | +- | +- | +- | +- |
| | 20 | 10 | +- | +- | + | + | +2 | + | 3+ |

Viable bacteria were measured by colony formation assay. -, no cytotoxic effect was observed; +-, cytotoxic effect was observed but the colonies were uncountable; +, 100 to 5000 colonies were formed; 2+, 10 to 100 colonies were formed; 3+, less than 10 colonies were formed.

were used the number did not change at all. Similarly, the number of swan virus decreased from the initial value of 106.75 to 104.75 and less than 100.75 (inactivation score = 99.999%) after 1 and 10 minutes, respectively, by the use of the antiviral mask. Thus, FePc(COOH)₈-processed non-woven fabric had a virucidal effect on the influenza and bird flu virus. Later it was shown that the fabric is also effective against swine flu. The mask had functions of sterilization, disinfection, anti-allergy and deodorization. Encouraged by these results, we decided to check the effect of cotton socks dyed with FePc(COOH)₈ on athletes' foot fungus. It is well known that athletic shoes of young people smell very badly in summer. We therefore asked some young people to wear a sock dyed with FePc(COOH)₈ on one foot and a sock without FePc(COOH)₈ on the other foot. After 7 hours, the socks were removed, and the back side of the foot was pressed on an agar culture medium for 5 seconds, then cultured for 13 days at 36 degrees. While fungal growth was recognized from feet which with socks without FePc(COOH)₈, no growth of fungi was observed from feet with FePc(COOH)₈-treated cotton socks.

c) Application for medical use: bandages and

underwear. We prepared bandages dyed with FePc(COOH)₈, and used them for treatment of bedsores and burn injuries. Bedridden elderly people suffer from bed sores. We have received positive customer feedback that bed sores did not occur after using a processed mattress manufactured from FePc(COOH)₈-supported rayon staple fiber. Therefore, FePc(COOH)₈-processed cloths were applied to affected areas of bedridden patients. Their symptoms gradually improved, and full recovery was observed. A similar result was obtained when such cloths were applied to burn wounds on skin. Again, the skin showed good recovery progress.

Compared with untreated patients, the healing time was shortened by 20-30%, probably due to the prevention of bacterial growth.

Cotton underwear processed with FePc(COOH)₈ were also prepared and applied to 142 patients with heavy atopic dermatitis in three university hospitals and one private hospital. Significant improvement was observed in the scores of itching, scratch marks and eczema after 1, 2 and 4 weeks. Possible mechanisms of pruritus reduction effects are as follows: (1) Allergen protein introduced by ticks into the body is enzymatically oxidized by FePc(COOH)₈ on fiber thereby changing its structure to a form which does not cause itching. (2) Toxic proteins produced by bacteria on the skin surface react with FePc(COOH)₈ changing its structure to one which does not cause itching. (3) Histamine or other itch-causing substances exuded from scratch scars are absorbed by FePc(COOH)₈ and enzymatically decomposed. Meanwhile, the athlete's heavy foot fungus had healed completely after 79 days just by wearing cotton socks dyed with FePc(COOH)₈.

d) Plants for decomposing harmful halogenated compounds.

We wanted to examine whether our



FePc(COOH)₈ can decompose dioxin, but no one would carry out this experiment due to fear of its high toxicity. We therefore chose trichlorophenol (TCP) as a substrate for H₂O₂-oxidation, and examined whether or not it can be decomposed in the presence of a polymer containing FePc(COOH)₈ catalyst. It was found that TCP was decomposed within a few minutes, accompanied by the liberation of chlorine. In the later half of the 20th century, several chemical companies in Japan suffered from the accumulation of PCB (poly chlorinated biphenyls). Since the TCP was easily decomposed by FePc(COOH)₈, experimental

incinerators for burning of PCB were built in several places.

Conclusions

Tetra- and octa-carboxylated iron and cobalt phthalocyanines exhibit a high catalytic activity in oxidation reactions of organic molecules. These phthalocyanines are therefore applied in various fields as sterilization, disinfectant, anti-allergenic and deodorizing materials. These activities are enhanced when the compounds are linked with fibers or polymers, rather than when used as a powder. ■

Prof. Kobayashi holds two Ph.D. degrees both from Tohoku University, Sendai, Japan. The first, earned in 1978, is in Science and was in the area of peroxidase and catalase. The second, obtained in 1985, is in Pharmacy and involved iron and cobalt porphyrins and phthalocyanines, a subject he is passionate about even today. In between his two Ph.D.s, he spent an year at The Ohio State University as a Visiting Scientist. He joined his alma mater, Tohoku University, as a faculty in 1984 and became Professor in 1995. He was Visiting Professor at ESPCI, Paris, where Madam Curie discovered radium. He retired from Tohoku University in 2015 and has been Research Professor at Shinshu University since then.

Prof. Kobayashi's research interests include electro-reduction of oxygen, design and synthesis of low-symmetry giant aromatic molecules, spectroscopic properties of chromophores and application of giant macrocyclic compounds for photodynamic therapy. In 2006 the Chemical Society of Japan honoured Prof. Kobayashi with its Award for Creative Work in the chemistry of giant aromatic molecules. He was commended by the Ministry of Education, Culture and Sports in 2012 for his contribution to science and technology. Last year he was bestowed with an award from the Society of Electron Systems.

A much sought after speaker, Prof. Kobayashi has delivered over 120 invited talks in national and international conferences and in Japanese and foreign universities. He has published over 440 papers in top-class journals and authored over 70 critical reviews and book chapters.

Prof. Kobayashi enjoys travelling, listening to classical music, learning about old cultures and working in a farm or a garden. He also enjoys a glass of good wine.



- DMAI submitted a representation for Renewal of 'N' Form for at least one year instead of 1 month to Shri. Ajoy Mehta, IAS Municipal Commissioner Municipal Corporation of Greater Mumbai on 17th February 2017 to avoid the hardships encountered by our members.
- On 10-3-2017, DMAI submitted information to the Dept. of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, GOI and Power Finance Corporation Ltd regarding power requirement for the colorant industry upto 2027.
- A representation was sent on 17th March 2017 to the Joint Secretary (Drawback), Dept. of Revenue, Central Board of Excise & Customs, Ministry of Finance requesting them to reinstate the DBK rate at least to 1.5% for our industry from 1.9% with effect from 15-11-2016, while offering our comments on proposed GST.
- Representation was sent on 27-3-2017 to the Dept. of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, GOI for inclusion of Fluorescent Brightening Agents/Optical Brightening Agents falling under Tariff Item No. 3204.2010 for concession on imports into Australia & New Zealand.



Seminars & Meetings

Half Yearly Meeting at Puducherry (Pondicherry)

Half Yearly Meeting was held at Puducherry (Pondicherry) on 12-15 January 2017. 17 members and their spouses participated

Meeting held on 13th January 2017 was chaired by President Shri Jitendra Patel and he welcomed the members, who had attended fairly in large number. Hon.Secretary Shri C.K. Singhania presented the Half Yearly report.



In the absence of Hon.Treasurer Shri Rajen Shah, Shri Singhania also presented the provisional financial highlights for the period from 1-4-2016 to 31-12-2016. Many important and pressing issues concerning the colorant industry like high cost of raw materials, pollution, environmental issues etc were discussed at length. A few members participated in the deliberations very enthusiastically. The meeting ended with a vote of thanks by Dr.Shavak Bhungara, 2nd Vice President (?). Due to paucity of time, the Lt.Governor,



Mrs.Kiran Bedi, who had agreed to address the members, could not make it.

An outing to the picturesque Pichavaram, one of the largest mangroves in the country by steamer boats was quite exciting and entertaining. The members also visited some of the ancient and historical temples in South India near Puducherry and the famous Mamllapuram Beach. All members and their spouses thoroughly enjoyed the sojourn to these tourist attractions.



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Forthcoming Events

China Interdye 2017 Exhibition

The 17th China Interdye 2017 Exhibition is being organized by China Dyestuff Industry Association on 12-14 April 2017 at Shanghai World Expo Exhibition & Convention Center (SWEECC), Shanghai, China. As it is an international Dye / Pigments and Textile Chemicals Exhibition, our Association has decided as in the past to visit the Exhibition with its members in a delegation. The details of our tour were already circulated to our members. Members may take advantage by participating in the delegation for mutual benefits.

Asia Textile Innovation Forum 2017

A two day Asia Textile Innovation Forum has been arranged by Green Link Group on 19th & 20th April 2017 in hotel JW Marriott, Juhu. We are pleased to inform you that our Imm.Past President Shri Janak Mehta would deliver Keynote speech on 20th April 2017 on a topic reserved for DMAI.

ChemSpec India 2017, Mumbai

The 13th ChemSpec India 2017 show has been arranged on 25-26 April 2017 at NSE compound, Goregaon (E), Mumbai. The show is exclusively dedicated to the fine and specialty chemical business and over 250 companies from India and abroad will be showcasing their capabilities. A detailed circular regarding the expo has already been sent to our members on 7th March 2017.

Planet Textiles 2017 Summit

A Summit on 'The Sustainable Textile' been arranged by MCL News & Media in their Planet Textiles 2017 Expo on 24th May 2017 at J.W. Marriott Hotel, Bangalore. A detailed circular regarding the Summit has already been sent to our members on 15th March 2017



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