DEPARTMENT OF
POLYMER & SURFACE
ENGINEERING
The department was established in the year 1946 and was offering a B.Sc (Tech) course for two years in Technology of Plastics and Technology of Paints, Pigments and Varnishes. In 1952, along with other divisions three years B.Sc (Tech) program was introduced. Earlier it was known as Paints, Pigments and Varnishes (PPV) Section. The B.Sc. (Tech.) courses were converted into post-B.Sc. three-year courses in 1966 and finally converted into B. Tech. programmes, which are post-HSSC (12th Grade) in 1998. M.Sc Tech. in Chemical Technology came into existence in the year 1961. The M.Sc. (Tech.) courses were converted into post-B.Tech. four year courses in 2002. The department also offer Ph.D.Tech. and Ph.D. Sci. degrees.

In the beginning of the department Dr. T. N. Mehta was the only staff member. Later on, the division progressed under stewardship of Late Professor N.R. Kamath who was a visionary. After him Professor S. P. Potnis carried the torch with great ability. From 1991 to 2005, Professor D. D. Kale was head of the Division who shared a major contribution for the developmental developments. Prof. V. C. Malhe, Professor M.A. Shenoy, Professor P. A. Mahanwar are the past HODs of Polymer & Paints Departments respectively. From 1st August 2015 Professor R.N Jagtap is the Head of Department.

The intake strength was only four students per year in Polymer and surface engineering Technology branches. Later on, the strength was increased to 8 per year and now it is 16 per year in each of these two technology courses. The department received a grand donation of 1 crore from Plastindia Foundation, Mumbai in 1997 to initiate the new program – three semesters M.Sc. (Tech) in Plastics Processing in addition to regular technology course. In the year 1999, the department received donation of modern equipments worth USD 100,000 from Gratag Macbeth of USA in association with Advanced Graphics Systems, India. Today, this department boosts of being the best equipped laboratory comparable with or better than laboratories in many advanced countries.

**MAJOR THRUST OF RESEARCH AREAS:**
- Polymer Recycling, Blends, Rheology, Polymer Processing.
- Synthesis of Nanomaterials and nanocomposites
- Ecofriendly coatings, Hybrid coatings
- Structure property relationship
- Living Radical Polymerization, Synthesis of Functional monomers
- Polymer Blends and alloys
- Polyurethane Dispersion, Anticorrosive Coatings.
- Particulate Polymer Composites, Bionanocomposites, Biodegradable Polymers and Composites, Speciality Coatings.
- Electrical insulation, Water-soluble Resins Structure Property Correlations of Coatings, Electrospinning

**RESEARCH AREAS:**
- Soluble Resins Structure Property Correlations of Coatings, Electrospinning
- Living Radical Polymerization for Tailor-made Polymers, Nanomaterials and Nanocomposites
- Ecofriendly coatings, Hybrid coatings
- Structure property relationship
- Living Radical Polymerization, Synthesis of Functional monomers
- Polymer Blends and alloys
- Polyurethane Dispersion, Anticorrosive Coatings.
- Particulate Polymer Composites, Bionanocomposites, Biodegradable Polymers and Composites, Speciality Coatings.
- Electrical insulation, Water-soluble Resins Structure Property Correlations of Coatings, Electrospinning

**Research Interests:**
- Corrosion Science and Prevention
- Environment Friendly Coatings
- High Performance Coatings
- Advanced Paints Technology II
- Advanced Surface Coating Technology II

**Research Publications:**
- International - 07
- Peer-reviewed - 05
- Conference proceeding - 04
- International - 04
- National - 03

**Research Students:**
- M.Tech. : 11
- Ph.D.(Tech.) : 07
- Ph.D.(Sci.) : 04
- M.Tech. - 11

**Projects Sponsored:**
- National - 03
- International - 69
- Government - 3
- Private - 2

**Patents:**
- National - 03
- International - 69
- Private - 2

**Professional Activities:**
- Member of UAA
- Member Governing council of ICPE
- Member of IPI
- Member of Colour society
- Member of DSIR

**Research Interests:**
- Utilization of non conventional energy for polymerization, Super Absorbents
- Synthesis and Characterization of specialty polymers for Controlled release, Surface coatings, Nanocomposites, Bionanocomposites, Utilization of non conventional...
nanocellulose (whiskers, particles and nanofibers) etc. using conventional & cavitation approach and its applications in polymer (synthetic as well as biopolymer) composites and coatings to enhance their performance properties.

Synthesis of Polyamide hot melt adhesives and its applications.

Modification of fly ash and its applications in polymer composites and coatings to enhance their performance. Synthesis of Nanoemulsions using conventional methods as well as acoustic cavitation like polystyrene, PMMA etc.

Discoloration and dewaxination of Shellac

Preparation of conductive coatings.

**SUBJECTS TAUGHT:**

- Technology of Thermoplastics – I
- Technology of Thermoplastics – II
- Technology of Thermoplastics – III
- Synthesis & Characterization of resins & polymers-I
- Synthesis & Characterization of resins & polymers-II
- Synthesis & Characterization of resins & polymers-III
- Processing of Polymers-I
- Processing of Polymers-II
- Processing of Polymers-III
- Compounding and Polymer Processing-II

**RESEARCH INTERESTS:**

- Novel approached synthesis of Nano particles,
- Polymer melt Rheology,
- Cellulose based Polymer Nanocomposites,
- Bio Nanocomposites,
- Synthesis of resins from renewable resources.

**RESEARCH STUDENTS:**

- Ph.D.(Tech) - 14
- Masters - 13
- Ph.D.(Sci)- 02

**RESEARCH PUBLICATIONS:**

- International -11,
- National - 00,
- Conference Proceedings 1 Peer-reviewed -10

**PATENTS:**

- National: 03 (Filed)

**SPONSORED PROJECTS:**

- Government: 04
- Private: 03

**PROFESSIONAL ACTIVITIES:**

- Secretary, Indian Plastics Institute, Mumbai Chapter.
- Member The Color Society, India
- Governing Member, The Society for Polymer Science, India
- Visiting Faculty in Amravati University
- Visiting Faculty for Indian Plastics Institute

- At present most of the work is being done on synthesis of nanomaterials such as Titanium dioxide, zinc oxide,
Processing of Paints III
Processing of Paints IV

**RESEARCH INTERESTS:**
- Resin Synthesis from renewable resources,
- Water Borne Coatings,
- Conductive coatings,
- Anticorrosive coatings,
- Electric Insulation Coatings

**RESEARCH STUDENTS:**
- Ph.D. (Tech.) - 04
- M.Tech. - 09

**SPONSORED PROJECTS**
- Government - 01
- Private - 01

**RESEARCH PUBLICATIONS:**
- International - 12
- Conference proceedings - 03

**PROFESSIONAL ACTIVITIES:**
- Member of Colour Society
- Member of ACS
- Member of UAA

**STUDENTS’ SEMINARS/PROJECTS/HOME PAPERS**

**SEMINAR (B.TECH.) POLYMER ENGINEERING & TECHNOLOGY**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Student</th>
<th>Seminar Topic</th>
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<tr>
<td>1</td>
<td>Vijayalakshmi Natarajan</td>
<td>A Literature Review of Benzoxazine Resins</td>
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<tr>
<td>2</td>
<td>Ankit Mishra</td>
<td>Form Stable Phase change Polymers Composites</td>
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<tr>
<td>3</td>
<td>Dhruva Marathe</td>
<td>Recent Advances in the manufacture of Light Emitting Polymers and their Applications.</td>
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<tr>
<td>4</td>
<td>Anvak Patil</td>
<td>Advances of Polymers in Separation Technology</td>
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<tr>
<td>5</td>
<td>Akshata Kulkarni</td>
<td>High Barrier Packaging for Cosmetic Applications</td>
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<td>6</td>
<td>Shrirang Chhatre</td>
<td>Biomimetic Polymers</td>
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<td>7</td>
<td>Darshil Shah</td>
<td>Nitrooxide mediated polymerization</td>
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<td>8</td>
<td>Jeeva Shah</td>
<td>Polymers in Electromagnetic Interference (EMI) shielding</td>
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<td>9</td>
<td>Prag Utekar</td>
<td>Synthesis of Different Polymers for Nano and Micro circuits and their Applications</td>
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<td>10</td>
<td>Harish Gabale</td>
<td>Green Approach to synthesis of Polyethylene Terephthalate</td>
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<td>11</td>
<td>Foram Prajapati</td>
<td>UV curable and LED curable Adhesives</td>
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<td>12</td>
<td>Kiran Kundaram</td>
<td>An Overview – Porous Polymers</td>
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<tr>
<td>13</td>
<td>Kailash Arole</td>
<td>Recycling of Electronic Waste</td>
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**STUDENTS**

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<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Mr. C.S. Kumbhar</td>
<td>Lab assistant</td>
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<tr>
<td>Mr. B.S. Satardekar</td>
<td>Lab assistant</td>
</tr>
<tr>
<td>Mr. D.R. Kadam</td>
<td>Instrument Mechanic</td>
</tr>
<tr>
<td>Mr. P. D. Patkare</td>
<td>Lab assistant</td>
</tr>
</tbody>
</table>

**SUPPORT STAFF**

- Mr. A.K. Dicholkar Lab assistant
- Mr. S. Hasaye Lab assistant
- Mr. M.A. Ansari Lab assistant

**DR. VIKRANT SHERTUKDE**
M.Sc (University of Mumbai), Ph.D. (Institute of Chemical Technology, Mumbai), DHE (University of Mumbai)
Emeritus fellow (All India Council of Technical Education), Dept. of Polymer & Surface Engineering

**SUBJECTS TAUGHT**
- Polymer Science & Technology II
- Polymer Science & Technology III
- Technology of Thermosets – I
- Technology of Thermoset Polymers- III
- Technology of Elastomers
- Packaging & Decoration of Plastics
- Polymer Blends & Alloys

**RESEARCH INTERESTS :**
- Nanocomposites,
- Polymer blends & alloys,
- Recycling of plastics,
- Synthesis of specialty polymers,
- Surface & interfacial energy studies in polymeric systems.

**RESEARCH STUDENTS :**
- Ph.D. (Tech.) - 02
- Ph.D. (Sc) - 04
- M.Tech. – 08

**RESEARCH PUBLICATIONS:**
- International - 03
- Conference proceedings - 08

**SPONSORED PROJECTS:**
- Government - 01
- Private - 02

**RESEARCH STUDENTS**
- Ph.D. (Tech.) - 02
- Ph.D. (Sc) - 04
- M.Tech. – 08

**PROFESSIONAL ACTIVITIES:**
- Life Member of Colour Society
- Life Member ACS
- Life Member UAA
### PROJECT (B. TECH.) POLYMER ENGINEERING & TECHNOLOGY

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Student</th>
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<tbody>
<tr>
<td>1</td>
<td>Vijayalakshmi Natarajan</td>
<td>Synthesis of MMA-DVB beads and microcapsules via suspension polymerization and their study for particle size and microencapsulation properties</td>
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<tr>
<td>2</td>
<td>Ankit Mishra</td>
<td>Microencapsulation of Stearic Acid as Phase Change Polymers</td>
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<td>3</td>
<td>Dhruva Marathe</td>
<td>Compatibilization Study of Polycarbonate/Poly(Styrene-co-acrylonitrile) blends</td>
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<tr>
<td>4</td>
<td>Anvay Patil</td>
<td>Effect of EVA concentration on the properties of Hot Melt Adhesives synthesized using low purity dimer acid and ethylene diamine</td>
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<td>5</td>
<td>Akshata Kulkarni</td>
<td>Development of Heat Stable Packaging for Cosmetic Packaging Application</td>
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<tr>
<td>6</td>
<td>Shrirang Chhatre</td>
<td>Effect of Molecular Weight of Polymer on the fibre diameter of Electrospun Poly(Acrylonitrile) synthesized by ATRP</td>
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<td>7</td>
<td>Kiran Kundaram</td>
<td>Effect of Compatibilizer and MMT ratios on Mechanical Properties of PP/PBT blend</td>
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<td>8</td>
<td>Kailash Arole</td>
<td>Chemical Indicating material by covalently bonding the sensing material to polymer matrix</td>
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<td>Neil Chavan</td>
<td>A Study of PBT Composites with Mica and Talc Fillers</td>
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<td>M Archish</td>
<td>To study the effect of MMT clay on properties of LDPE/EPDM blends</td>
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### SEMINAR (B. TECH.) SURFACE COATING TECHNOLOGY

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<tr>
<td>1</td>
<td>SHINDE-SANKET-VILAS</td>
<td>Recent development in Hyper branched Polyurethane</td>
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<td>2</td>
<td>PHADKE-SHANTANU</td>
<td>Review Literature on Coatings with Enhanced Efficiency for Solar Panel</td>
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<td>3</td>
<td>PODUVAL-SACHIN-JAYARAM</td>
<td>Polymeric nano and microcapsules and applications in control release coatings</td>
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<td>4</td>
<td>SONI-RUSHI-UMESHKUMAR</td>
<td>Printing Inks synthesis and their Application on Plastics and Porcelain</td>
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<td>5</td>
<td>VIGNESH-VISHAL-V SHANKAR</td>
<td>Utilization of Seedlac for Coating Applications</td>
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<td>6</td>
<td>KHANDELWAL-AYUSHI-RAKESH KUMAR</td>
<td>Overview of Hybrid Coatings</td>
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<td>7</td>
<td>NIKAM SHANTANU PRATAP</td>
<td>Protective Coatings for Oil and Gas Pipelines</td>
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<tr>
<td>8</td>
<td>JAIN SWARNIM VILAS</td>
<td>Review literature on Side Chain Crystallisable (SCC) Polymers</td>
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<td>9</td>
<td>BELHEKAR-NEHA-ANILKUMAR</td>
<td>Water based controlled release coatings</td>
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<td>KOWSHIKRAMAN-SETURAMAN</td>
<td>Refinish coating for car, ship, and plane</td>
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<td>11</td>
<td>SHARMA-RASHMI-SATISH</td>
<td>Utilization of nanomaterials in Reaction Injection Moulding</td>
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<td>RAUT-ANIKET- MADHUKAR</td>
<td>Recent Developments in Anti-Carbonation Coatings</td>
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<td>LINGAYAT-PANKAJ-JAGANNATH</td>
<td>Coatings used for stone based on alkoxysilane</td>
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<td>KHARAT-SHUBHAM-MOTIRAM</td>
<td>Literature review on Associative thickeners for water-based coatings</td>
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<td>15</td>
<td>AHUJA-GAURAV-PARASRAM</td>
<td>Self-Cleaning/Smart Coatings based on modified acrylate monomers</td>
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<td>16</td>
<td>AHER-KIRAN-SANJIAY</td>
<td>Coatings with radiation and thermal resistance</td>
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<td>EDLABADKAR-VAIBHAV-ARUN</td>
<td>Pre-treatments of Plastics for coating application.</td>
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<td>18</td>
<td>UMBARKAR-RACHANA-RAMKRISHNA</td>
<td>Recent developments in Water based Epoxy Resins</td>
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</table>
4 SONI-RUSHI-UMESHKUMAR
   A study on Polyvinyl Chloride plastisol for strippable coatings on metal substrate

5 VIGNESH-VISHAL-V SHANKAR
   Synthesis and characterization of a ricinoleic acid based reactive diluent for a UV curable polymer film.

6 KHADEVLAL-AYUSHI-RAKESH KUMAR
   Studies in Hybrid Coatings

7 NIKAM SHANTANU PRATAP
   Synthesis of thermosetting acrylic coatings using ATRP.

8 JAIN SWARNIM VILAS
   Synthesis of Side Chain Crystallizable (SCC) Polymer using Polyglycidylmerthacrylate and Stearyl amine.

9 BELHEKAR-NEHA-ANILKUMAR
   Microencapsulation of cypermethrin to synthesize mosquito repellent additive for interior wall paints

10 KOWSHIKRAMAN-SETURAMAN
   Inverse emulsion polymerization: A study on parameters for synthesis of stable inverse emulsion and factors affecting molecular weight.

11 SHARMA-RASHMI-SATISH
   Jute fibres as a raw material for extraction of micro/nanocrystalline cellulose.

12 RAUT-ANIKET-MADHUKAR
   Studies in Anti Carbonation coatings

13 LINGAYAT-PANKAJ-JAGANNATH
   RAFT polymerization of some More Activated Monomers (MAM) with synthesis of RAFT agent and its application

14 KHARAT-SHUHAM-MOTIRAM
   Study and synthesis of matting agent for paints.

15 AHUJA-GAURAV-PARASRAM
   Superhydrophilic polyacrylate nanocomposite latex for self-cleaning action

16 AHER-KIRAN-SANJAY
   To study the properties of polyurethane varnish

17 EDLABADKAR-VAIBHAV-ARUN
   Synthesis of inorganic-organic hybrid coating via sol-gel process

18 UMBARKAR-RACHANA-RAMKRISHNA
   Synthesis of water soluble epoxy resin derived from cardano

RESEARCH PROJECTS PH.D. (TECH)

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Name of Student</th>
<th>Previous Institute</th>
<th>Title</th>
<th>Guide</th>
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<tr>
<td>1</td>
<td>Mundhe Chaitanya M</td>
<td>ICT</td>
<td>Synthesis and Development Polymer Composites</td>
<td>V. V. Shertukde</td>
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<td>2</td>
<td>Nikam Pramod C.</td>
<td>UDCT, North Maharashtra University, Jalgaon</td>
<td>Thermally Stable Polymer Composites</td>
<td>V. V. Shertukde</td>
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<td>3</td>
<td>Jamdar Sahyog Vandana</td>
<td>Institute of Chemical Technology, Matunga</td>
<td>Studies in depolymerization of polymer wastes for coating applications</td>
<td>A. S. Sabnis</td>
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<td>4</td>
<td>Wazarkar Kunal Dattatray</td>
<td>Institute of Chemical Technology, Matunga</td>
<td>Development of Biobased monomers for coating applications</td>
<td>A. S. Sabnis</td>
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<td>6</td>
<td>Balgude Dinesh Babuji</td>
<td>Institute of Chemical Technology, Matunga</td>
<td>Modifications of Renewable Resources for Coating Applications</td>
<td>A. S. Sabnis</td>
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<td>8</td>
<td>Sharma Bhuvnesh</td>
<td>UPTU, Lakhnau</td>
<td>Development of high radiation high temperature and higher stress resistance polymer blend and composite for reactor, gasket and o ring</td>
<td>P. A. Mahanwar</td>
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<td>9</td>
<td>Gaikwad Pravin</td>
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<td>Studies in thermoplastic microfiber and nanofiber composites</td>
<td>P. A. Mahanwar</td>
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<td>10</td>
<td>Fuke Chandan</td>
<td>ICT</td>
<td>Study of Electron beam and chemical crosslinked heat shrinkable sheets for Electronic application.</td>
<td>P. A. Mahanwar</td>
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<td>11</td>
<td>Gorasia Khushi</td>
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<td>Studies in synthesis of conducting polymer nanofiber and coating for flexible batteries</td>
<td>P. A. Mahanwar</td>
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<td>12</td>
<td>Samarth Nikesh</td>
<td>ICT</td>
<td>Development of Chlorine resistant polymer Blend</td>
<td>P. A. Mahanwar</td>
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<td>13</td>
<td>Bhatnagar Manoj Praharaj</td>
<td>ICT</td>
<td>Polymer Nanofiber Synthesis and their Composites for Multitude Applications</td>
<td>P. A. Mahanwar</td>
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<td>Fiber Reinforced Composites.</td>
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<td>Development of Polymer Composites</td>
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<td>Shah Nidhi</td>
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<td>Structure Property Behavior of Polymer Nanocomposites</td>
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<td>ICT</td>
<td>Chemical modification of silane, polyesteramide, epoxy based resins and its application as industrial coatings</td>
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<td>Lal Sumit</td>
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<td>Modification of Biopolymer and its Potential Application for Sustainable Developments</td>
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<td>Patil Ajit</td>
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<td>Modification of Biopolymers by Atom Transfer Radical Polymerization Technique.</td>
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<td>Satdive Ajinkya Madan</td>
<td>Recent Development in TPV for Automobile Applications</td>
<td>Prof. (Dr.) R. N. Jagtap</td>
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<tr>
<td>2</td>
<td>15POL2003</td>
<td>Prajapati Jignesh Nitin</td>
<td>Advancement in non polar plastics for paintability</td>
<td>Prof. (Dr.) R. N. Jagtap</td>
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<tr>
<td>3</td>
<td>15POL2004</td>
<td>Gautampurkar Anshul Anant</td>
<td>Studies in High Impact and High Voltage outdoor Polymeric Insulators</td>
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<td>4</td>
<td>15POL2005</td>
<td>Bakshi Ashok Kumar</td>
<td>Comparative study between Natural Fiber and Synthetic Fiber for FRP Composite</td>
<td>Mr. A. R. Rao</td>
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<td>5</td>
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<td>Chaudhari Tushar</td>
<td>Overview of a biobased monomers for polymer &amp; coating application</td>
<td>Dr. P. A. Mahanwar</td>
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<td>Chauhan Mukesh</td>
<td>Intelligent Packaging</td>
<td>Dr. S. T. Mhaske</td>
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<td>Shukla Stuti</td>
<td>Phase Change Materials</td>
<td>Dr. S. T. Mhaske</td>
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<td>Decolorisation of CNSL</td>
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<td>Prajapati Jignesh Nitin</td>
<td>Development of TPV/TPE for automotive application</td>
<td>Dr. S. T. Maske</td>
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<td>4</td>
<td>15POL2005</td>
<td>Bakshi Ashok Kumar</td>
<td>Bio-fiber based epoxy composite and its mechanical and thermal performance studies.</td>
<td>Dr. V. V. Shertukde</td>
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<td>5</td>
<td>15POL2006</td>
<td>Chaudhari Tushar</td>
<td>Synthesis of polymers from biobased monomeric compounds</td>
<td>Dr. A. S. Sabnis</td>
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<td>6</td>
<td>15POL2007</td>
<td>Chauhan Mukesh</td>
<td>Environmentally degradable Polyolefins</td>
<td>Prof. (Dr.) R.N Jagtap</td>
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<td>7</td>
<td>15POL2009</td>
<td>Shukla Stuti</td>
<td>Synthesis of Polymeric Phase Change Material for household application</td>
<td>Prof. (Dr.) R. N. Jagtap</td>
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<td>8</td>
<td>15POL2010</td>
<td>Gaidhani Apurv Nitin</td>
<td>Synthesis of polyethylene wax from waste plastic and its characterization</td>
<td>Dr. A. S. Sabnis</td>
</tr>
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<td>9</td>
<td>15POL2011</td>
<td>Samant Tanmay Atmaram</td>
<td>Study of mechanical properties of hybrid epoxy composites using low gsm glass fibers</td>
<td>Dr. V. V. Shertukde</td>
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<td>10</td>
<td>15POL2012</td>
<td>Bramhecha Indrajit Chandrakant</td>
<td>Studies in synthesis of high temperature Polymers and their applications</td>
<td>Dr. A. S. Sabnis</td>
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<td>11</td>
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<td>Kulkarni Chinmay Pradeep</td>
<td>Sensors for various applications</td>
<td>Prof. (Dr.) R.N Jagtap</td>
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<td>12</td>
<td>15POL2014</td>
<td>Khanna Arush</td>
<td>Studies in development of volatile corrosion inhibitors Films for packaging application</td>
<td>Prof. (Dr.) P.A. Mahanwar</td>
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<tr>
<td>13</td>
<td>15POL2015</td>
<td>Shaikh Rizwan Irfan</td>
<td>Studies in reclamation of used engine oil using polymeric flocculants</td>
<td>Prof. (Dr.) P.A. Mahanwar</td>
</tr>
<tr>
<td>14</td>
<td>15POL2016</td>
<td>Kulkarni MadhumitaSubodh</td>
<td>Studies in the development of volatile corrosion inhibitors and polymeric desiccants for packaging application</td>
<td>Prof. (Dr.) P.A. Mahanwar</td>
</tr>
<tr>
<td>15</td>
<td>15POL2017</td>
<td>Bhagat Ajit Babarao</td>
<td>Synthesis of polyamide hot melt adhesive</td>
<td>Dr. S. T. Maske</td>
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### PLACEMENT AND HIGHER STUDIES B.TECH POLYMER

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<th>Roll No</th>
<th>Name</th>
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<td>12POL001</td>
<td>Vijayalakshmi N</td>
<td>IIM, Lucknow</td>
<td>Self Funded</td>
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<tr>
<td>12POL002</td>
<td>Ankit Mishra</td>
<td>Pidilite Industries- Graduate Engineering Trainee</td>
<td>5 lac</td>
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<tr>
<td>12POL003</td>
<td>Dhruba Ajit Marathe</td>
<td>TU Delf</td>
<td>Self funded Masters</td>
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<tr>
<td>12POL004</td>
<td>Anway Arun Patil</td>
<td>University of Akron</td>
<td>25,000$</td>
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<td>12POL006</td>
<td>Akshata Rajesh Kulkarni</td>
<td>University of Akron</td>
<td>25,000$</td>
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<tr>
<td>12POL008</td>
<td>Shrirang Chhatre</td>
<td>University of Delaware</td>
<td>27,500$</td>
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<td>12POL009</td>
<td>Darshil Shah</td>
<td>Columbia University</td>
<td>Self Funded</td>
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<tr>
<td>12POL100</td>
<td>Jevin Shah</td>
<td>IIT, Bombay</td>
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<td>12POL101</td>
<td>Parag Utekar</td>
<td>Pidilite Industries- graduate Engineering Trainee</td>
<td>5 lac</td>
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<tr>
<td>12POL102</td>
<td>Harish Gabale</td>
<td>Atul Industries</td>
<td>3.6 lac</td>
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<td>12POL103</td>
<td>Foram Prajapati</td>
<td>Gharda Chemicals- Graduate Engineering Trainee</td>
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<td>12POL104</td>
<td>Kiran Kundaram</td>
<td>P S Takecare- Business Development Executive</td>
<td>4.5 lac</td>
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### GOVERNMENT AGENCIES:

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<tr>
<th>No.</th>
<th>Sponsor</th>
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<th>Duration</th>
<th>Total Amount (Rs.)</th>
<th>Principal Investigator</th>
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<tbody>
<tr>
<td>1</td>
<td>BRNS</td>
<td>High energy radiation assisted depolymerization of polyethylene terephthalate for coating applications</td>
<td>2 years</td>
<td>21,00,000</td>
<td>A. S. Sabnis</td>
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### PLACEMENT AND HIGHER STUDIES B.TECH SURFACE COATINGS

<table>
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<th>Sr No.</th>
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<tbody>
<tr>
<td>1</td>
<td>SHANTANU PHADKE</td>
<td>Carnegie Mellon University</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SWARNIM JAIN</td>
<td>MBA</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>AYUSHI KHANDELWAL</td>
<td>DOW Chemicals- Manufacturing and Engineering Development (Project Engineer)</td>
<td>9.2 lpa</td>
</tr>
<tr>
<td>4</td>
<td>NEHA BELHEKAR</td>
<td>Higher Studies</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>KOWSHIKRAMAN S</td>
<td>JoB</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>PANKAJ LINGAYAT</td>
<td>Higher Studies</td>
<td></td>
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<tr>
<td>7</td>
<td>GAURAV AHUJA</td>
<td>Kupsa Coatings - Graduate Engineering Trainee</td>
<td>4.62 lpa</td>
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<tr>
<td>8</td>
<td>KIRAN AHER</td>
<td>Pidilite Industries- Graduate Engineering Trainee</td>
<td>4.32 lpa</td>
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<tr>
<td>9</td>
<td>VAIBHAV EDLABADKAR</td>
<td>Sudarshan Pigments- Graduate Engineering Trainee</td>
<td>4 lpa</td>
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<tr>
<td>10</td>
<td>RACHNA UMBARKAR</td>
<td>IIT Kharagpur law</td>
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<tr>
<td>11</td>
<td>SANKET SHINDE</td>
<td>JOB</td>
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<tr>
<td>12</td>
<td>SACHIN PODUVAL</td>
<td>UC San Diego</td>
<td>Self funded MS</td>
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<tr>
<td>13</td>
<td>RUSHI SONI</td>
<td>Missouri S&amp;T Rolla</td>
<td>Fully funded PhD</td>
</tr>
<tr>
<td>14</td>
<td>VISHAL VIGNESH</td>
<td>University of Florida, Gainesville</td>
<td>$1500 per semester (MS)</td>
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<tr>
<td>15</td>
<td>SHANTANU NIKAM</td>
<td>University of Akron</td>
<td>Self funded MS</td>
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<tr>
<td>16</td>
<td>RASHMI SHARMA</td>
<td>SUNY Stony Brook</td>
<td>Self funded MS</td>
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<tr>
<td>17</td>
<td>ANIKET RAUT</td>
<td>SUNY Stony Brook</td>
<td>Self funded MS</td>
</tr>
<tr>
<td>18</td>
<td>SHUBHAM KHIRAT</td>
<td>M.Tech ICT</td>
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</table>
### 2. BRNS
- Development of volatile organic compound (VOC) free radiation indicator labels along with prototype product manufacturing.
  - Duration: 3 years
  - Total Amount: 25,00,000/-
  - Principal Investigator: S.T Mhaske

### 3. DST, Govt of India
- Synthesis and characterization of nano-cellulose and its application in biodegradable polymer composite films for food packaging.
  - Duration: 3 years
  - Total Amount: 32,73,000/-
  - Principal Investigator: S.T Mhaske

### 4. TEQIP, CoE
- Synthesis of Metal Oxide Nanoparticles
  - Total Amount: 23,00,000/-
  - Principal Investigator: S.T Mhaske

### 5. DBT under Indo-Australia
- Integrated Biorefinery for Production of Sorghum Seed Protein
  - Duration: 2 years
  - Total Amount: 1,17,00,000/-
  - Principal Investigator: S. T. Mhaske

### 6. AICTE, New Delhi
- Development of Conducting Polymer nanofibers by Electrospinning and Polymer Nano fiber composites for Fuel Cells
  - Duration: 2013-2016
  - Total Amount: 9,90,000
  - Principal Investigator: P. A. Mahanwar

### 7. BRNS
- Development of Heat Shrinkable cable and sheets for electrical and electronic application
  - Duration: 2014-2017
  - Total Amount: 35,00,000
  - Principal Investigator: P. A. Mahanwar

### 8. RGST
- Development of Controlled Release formulations of Agrochemicals
  - Duration: 2015-2018
  - Total Amount: 53,00,000
  - Principal Investigator: P. A. Mahanwar

### 9. BRNS
- ClayFilled LLDPE Nanocomposites Film For Modified Atmospheric Packaging with Improved Barrier Properties in Food Application
  - Duration: 3 years
  - Total Amount: 9,00,000
  - Principal Investigator: R.N Jagtap

### 10. UGC-DRS
- Controlled Radical Polymerization
  - Duration: 5 years
  - Total Amount: 9,00,000
  - Principal Investigator: R.N Jagtap

### 11. BRNS
- Green approach for recycling of e-waste through radiation processing
  - Duration: 1 year
  - Total Amount: 9,00,000
  - Principal Investigator: R.N Jagtap

#### PRIVATE AGENCIES

<table>
<thead>
<tr>
<th>No.</th>
<th>Sponsor</th>
<th>Title</th>
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<th>Total Amount (Rs.)</th>
<th>Principal Investigator</th>
<th>Research Fellow</th>
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<tbody>
<tr>
<td>1.</td>
<td>Unilever</td>
<td>Shape Selective Isolation and Surface Chemical Modification of Nanocellulose</td>
<td>3 YEARS</td>
<td>37,00,000/-</td>
<td>S.T Mhaske</td>
<td>Singh Hitesh</td>
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### PUBLICATIONS

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<tr>
<th>No.</th>
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<th>Journal</th>
<th>Vol. No.</th>
<th>Pages</th>
<th>Year</th>
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<tr>
<td>1.</td>
<td>Modified poly (butyl methacrylate-b-glycidyl methacrylate) dispersant for solvent-based paint by Reverse Atom Transfer Radical Polymerization</td>
<td>Progress in Organic Coatings</td>
<td>90</td>
<td>359-368</td>
<td>2016</td>
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<td>No.</td>
<td>Authors</td>
<td>Title</td>
<td>Journal</td>
<td>Volume/Issue</td>
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<td>4.</td>
<td>UV-Curable behavior of phosphorous and nitrogen based reactive diluent for epoxy acrylate oligomer used for flame retardant wood coating. Sachin Chambhare, Gunawan P. Lokhande, R.N. Jagtap*</td>
<td>Journal of Coatings Technology and Research</td>
<td>-</td>
<td>-</td>
<td>DOI: 10.1007/s11998-015-9777-x</td>
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<td>22.</td>
<td>KV Yeole, LH Mahajan, ST Mhaske</td>
<td>Polymer Composites</td>
<td>3 (2)</td>
<td>186-190</td>
<td>2015</td>
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<td>23.</td>
<td>PG Nihul, ST Mhaske#, VV Shertukde</td>
<td>Iranian Polymer Journal</td>
<td>23 (8)</td>
<td>599-608</td>
<td>2015</td>
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<td>24.</td>
<td>KV Yeole, LH Mahajan, ST Mhaske</td>
<td>Polymer Composites</td>
<td>3 (2)</td>
<td>186-190</td>
<td>2015</td>
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</table>
25. Aarti More, Ravindra kute, Shashank Mhaske  
Pigment and Resin Technology 23(11) 869-879 2015

Iranian Polymer Journal 23(1) 59-67 2015

27. Preparation and analysis of novel hydrogels prepared from the blend of guar gum and chitosan: cross-linked with glutaraldehyde, S. S. R. S. Kud, P. G. Kadam and S. T. Mhaske*  
Journal of Vinyl and Additive Technology - - 2015

Journal of Applied Polymer Science 23 599-608 2014

Iranian Polymer Journal 23(11) 869-879 2015

30. Epoxidized rice bran oil (ERBO) as a plasticizer for poly(vinyl chloride) (PVC) , Pratiksha G. Nihul, Shashank T. Mhaske, Vikrant V. Shertukde  
International Journal of Polymer Science 1 1-12 2015

31. Synthesis and Characterization of Imide Containing Hybrid Epoxy Resin with Improved Mechanical and Thermal Properties, U.G.Rane, A.A.Sabnis1, and V.V. Shertukde  
International Journal of Polymer Science 2014

32. Synthesis and characterization of slip additive functioning as an intercalating agent, Prarthana U. Dhanvijay, Vaishnav D. Gharat, Vikrant V. Shertukde  
International Journal of Plastics Technology 18 100-112 2014

33. Wazarkar K., Kathalewar M., Sabnis A., Flammability behavior of unsaturated polyesters modified with novel phosphorus containing compounds  
Polymer Composites In press - 2015

34. Wazarkar K., Kathalewar M., Sabnis A., Improvement in flame retardancy of polyurethane dispersions by newer reactive flame retardant  
Progress in Organic Coatings In press - 2015

35. Wazarkar K., Kathalewar M., Sabnis A., Reactive Modification of Thermoplastic and Thermoset Polymers Using Flame Retardants: An overview  
Polymer-Plastics Technology and Engineering In press - 2015

36. Mehta, B., Kathalewar, M., Sabnis, A., Cyclic Carbonated Soyabean Oil as Plasticizer for PVC for Replacing Di- octyl Phthalate  
Journal of Polymer Materials 31 17-29 2015

37. Kathalewar, M., Sabnis, A., Effect of molecular weights of phenalkamines on the curing, mechanical, thermal and anticorrosive properties of epoxy based coatings  
Progress in Organic Coatings 84 79-88 2015

European Polymer Journal 85 620-34 2016

39. Development of epoxy-urethane hybrid coatings via non-isocyanate route, Wazarkar, K.,Kathalewar, M.,Sabnis, A  
European Polymer Journal 84 812-27 2016

40. Investigation of CNSL-Based hybrid sol in conventional polymeric material, Balgude, D.,Sabnis, A.  
Journal of Renewable Materials 2 2016

41. Urea-phenol-formaldehyde microcapsules containing linseed oil for self-healing anticorrosive coating applications, Patil, D, Sabnis A,  
Advanced Materials Letters 2016

42. Microencapsulation: an emerging technique in the modern coating industry, Wazarkar, K.,Patil, D.,Rane, A.Kathalewar, M.,Sabnis, A.  
RSC Advances 6 964-79 2016

43. Preparation of novel CNSL-Based urethane polyol via nonisocyanate route: Curing with melamine-formaldehyde resin and structure-property relationship, Kathalewar, M.,Sabnis, A.  
Journal of Applied Polymer Science 132 2015

44. Non-isocyanate polyurethane (NIPU) from tris-2-hydroxy ethyl isocyanurate modified fatty acid for coating applications, Pathak, R.,Kathalewar, M.,Wazarkar, K.,Sabnis, A.  
Progress in Organic Coatings 160-69 2015
### IN-HOUSE FACULTY RESPONSIBILITIES

**PROFESSOR R. N. JAGTAP**
Arranging visiting faculties and visiting professors
Maintaining and refurbishment of the research labs
Smooth conduct of the class and practicals
Placement incharge

**SHRI A. R. RAO**
Timetable Committee

### PATENTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Inventors</th>
<th>Title</th>
<th>Country</th>
<th>Funding Agency</th>
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### EVENTS ORGANIZED

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title of Workshop/Seminar/Conference</th>
<th>Speaker</th>
<th>Date of Event</th>
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<tbody>
<tr>
<td>1.</td>
<td>ICT – IRMA WORKSHOP “Influence of Resins on Coating Performance”</td>
<td>Several Invited Speakers</td>
<td>2nd April, 2016</td>
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<tr>
<td>3.</td>
<td>Workshop on “SKILL DEVELOPMENT IN SORTING, SEPARATION AND PROCESSING OF PLASTIC WASTE”</td>
<td>Several Invited Speakers</td>
<td>13 March, 2016</td>
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### WORKSHOPS/SUMMER CONFERENCES/SYMPOSIA/SEMINARS/LECTURES/PAPER WORKSHOPS/ SUMMER SCHOOLS ATTENDED/ ORAL OR POSTER PRESENTATIONS

**SHORT ABSTRACT ON SALIENT FEATURES OF RESEARCH WORK**

Guide: Professor R. N. Jagtap
Name of the student: Ingale Raghunath Pralhad
Degree: Ph. D. (Science)
Thesis title: Water Based Pressure Sensitive Adhesive

**Abstract:** Pressure sensitive adhesives (PSAs) chemistry spin around the long chain acrylate such as poly (butyl acrylate), poly (2-ethylhexyl acrylate) and poly (iso-octyl acrylate) having Tg less than -550C. The long chain acrylate possesses lower water solubility therefore miniemulsion is preferred as compare to conventional emulsion polymerization. Controlled living radical polymerization was utilised to prepare homopolymers and copolymers of derived molecular weight and molecular weight distribution. The synthesized emulsions were characterized thoroughly. The synthesized emulsions were employed as pressure sensitive adhesive. The adhesive properties were tested on low surface energy materials (such as PET, BOPP and plasticized PVC) and higher energy surface materials (such as uncoated paper, coated paper and aluminium). The effect of molecular weight and molecular weight distribution of polymers on adhesive properties of higher surface energy materials. The various functional materials were used for low surface energy materials. The chain extensions of polymers were carried out to study adhesive properties to aluminium. The adhesive properties of PSAs were evaluated by lap shear strength, peel strength, tack measurement and shear holding strength.

Name of the student: Sachin U Chambhare
Degree: Ph. D. (Science)

**Abstract:** Free radical polymerization with reversible addition-fragmentation chain transfer (RAFT) polymerization, receiving more attention among the other controlled polymerization techniques. Like nitrogen mediated polymerization (NMP) and Atom transfer radical polymerization (ATRP) RAFT polymerization technique can used wide range of monomers having different functionalities, variety of solvents and initiators for polymerization. RAFT mediated controlled radical polymerization is based on equilibrium between active and dormant species, achieved by a degenerative chain transfer process, by using various chain transfer agents like dithioester, dithioxanthate and dithiocarbamate. RAFT polymerization is widely used for the synthesis of block Co-polymers having...
definite molecular weight, narrow polydispersity and with complex architecture like star, block, microgel and hyperbranched with high purity. Thus by selecting the appropriate RAFT agent, we are able to synthesize the block co-polymers of definite molecular weight and narrow polydispersivity which can be used for solvent and water borne coatings.

Name of the student: Lokhande Gunawant Pandharinath
Degree: Ph. D. (Science)
Thesis title: Synthesis of Copolymer for the Coating applications using control
Abstract: The development of control-living polymerization methods has been a long standing goal in polymer chemistry. All these methods are based on establishing a rapid dynamic equilibrium between a minute amount of growing free radicals and large majority of dormant species the dormant species may be alkyl halides in ATRP thioester as in reversible addition fragmentation chain transfer process (RAFT) alkoxysilane as in nitroxide mediated polymerization (NMP) or stable free radical polymerizations (SFRA) a control radical polymerization include activation and deactivation step and generated free radicals propagates and terminates as in conventional free radical polymerization. By using this method average molecular weight of polymer made by well controlled free radical polymerization processes This technique helps in syntheszing macromolecules with complex architectures including block, graft, comb, and star structures with predetermined molecular weight by using suitable raft agent. This techniques help to synthesis additives which act as efficient wetting and dispersing agent, rheology modifier, thickener, decorative and architectural paint and many more.

Student's Name: Mr. Dipak S. Tathe
Thesis Title: Modified biosources material for coating applications
Degree: Ph. D. (Science)
Abstract: The declining petroleum reserves, fluctuating price of petroleum based products and the stringent environmental rules and regulations have prompted to the utilization of the natural renewable resources in both scientific and industrial communities, most importantly they are biodegradable. The various natural materials are available such as, carbohydrates, Vegetable oil, Rosins, Lignin, Tannin etc. Among these, vegetable oils are easily available renewable material. Vegetable oil is triglyceride of fatty acids consisting of several reactive groups that are anenable to chemical reactions i.e. ester groups, C=C double bonds, allylic positions and the $\alpha$-position of ester groups. These can be used to polymerize triglycerides directly or to modify the triglyceride structure. These derivatives of oil or modified oil have been used in automotive, lubrication, biomedical and oil field etc. Oils derived from cashew nut, natural rubber, Pongamia glabra, karanja, rapeseed, Anonna squamosa, Moringa oleifera along with some traditional vegetable oils like linseed, soybean, coconut, castor, sunflower, palm oils have been successfully utilized to produce different types of industrial polymers in addition to other products.

Vegetable oils are natural high molecular weight compound, but it has some drawback in coatings such as adhesion and hardness. Therefore, in this research we modified the different oils such as Prosopis Juliflora oil, Balanites roxburghii oil, Abelmoschus ficulneus oil, castor oil, cottonseed oil, cardanol etc. with epoxy, silane, hydroxyl, isocyanate, allylic monomers etc. and used in the solvent based coatings. UV curable coatings and additives for paint

Student's Name: Ingale Raghunath Pralhad
Thesis Title: Synthesis of Novel Monomers for surface Coating Application
Degree: Ph.D. Sci.
Abstract: The interest in the novel monomer is increases because of their unique properties. Inrecent years, there are hundreds of organic reactions are reported in the literature. Trying to exploit some of the reaction like Baylili-Hillman reaction, Heck Reactions, Sonogashira Coupling, Suzuki Coupling etc. for synthesizing some monomers. In this project we envisage a possibility of substituting existing costly & carcinogenic monomers with the novel monomers which exhibit almost same properties like high temperature resistant, anti graffiti coating, antibacterial coating etc. These novel monomers which may contain functional groups.

In order to meet the requirement of the final coating applications copolymers are employed. In this different endeavor different Novel monomers and their corresponding copolymerized by polymerization technique. These binders would be employed as part of coating materials may be for High Temperature Resistance Coating, Antibacterial coating and Hygienic Coating etc.

Name of the student: Amit M. Gawde
Degree: M.Tech
Thesis Title: Study the Surface Properties of Polypropylene Blends and composites
Abstract: Polypropylene (PP), a member of Polyolefin's family is lightest amongst all. PP passes higher softening temperature, lower shrinkage and excellent environmental crack resistance. This versatile polymer is used to molded articles for house hold and medical application; however, largest applications are in films like Biaxial oriented polypropylene (BOPP) and automobile components. This chemically neutral polymer, gives edge of advantage in many applications, but poses serious limitation while decorating these objects. In order to alter the topology for improving the paint adhesion on this chemically inert material, surface preparation and treatment is necessary. However for bigger objects like automobile bumpers Chlorinated polypropylene (CPP) coat as primer is essential. In this endeavour the extra step of surface treatment and surface preparation is eliminated which adds Volatile organic compound (VOC) in the atmosphere and may deteriorate the mechanical properties of the object. For this blend and nanocomposites of PP are made in order to alter the surface characteristics and with the help of advanced characterization tools like Atomic force Microscopy (AFM) and Contact angle measurement the properties are evaluated.

Name of the student: Tyagee K. Chavan
Degree: M.Tech
Thesis title: Synthesis and Characterization of Polyimide Membrane
Abstract: Polyimides prepared from reaction of dianhydride and diisocyanates is a one step process and easier to synthesise than the standard two step process with reaction of dianhydride and diamine. Project aims to prepare high molecular weight polyimide membranes form Pyromellitic Dianhydride (PMDA) and 4, 4’-Di phenyl methane Diisocynate (MDI). Using various solvents and catalyst the molecular weight can be tailored. The membrane solution then casted on various
Epoxy resin is one of the most important materials in coating industry. The manufacture of its waterborne emulsion has received considerable attention in industrial field. There are two ways to produce waterborne epoxy emulsion. One is dependent on the external emulsifier to make the resin dispersed in water. The other is by way of chemical modification to introduce polar groups which confer water dispersibility to the resin. The former technology is simpler and cheaper, while the latter one can achieve very fine and well distributed emulsion (nm particles).

A novel waterborne modified epoxy coating was prepared by using different types of silanes like 3-glycidoxy propyl tri methoxy silane (GPTMS), MPTMS, etc., a termination agent of adduct, and liquid epoxy resin. The structure of the curing agent was characterized. The synthetic process and the effects of the amount of silanes on the properties of curing agent and performances of cured film were studied.

Name of the student: Pravin G Kadam
Degree: Ph.D (Tech)
Thesis title: Polymer Nanocomposites: Preparation And Applications
Abstract: Poly (vinyl chloride) (PVC) /Thermoplastic polyester elastomer (Hytrel) blend system prepared in 50:50 composition was found to have a highest possible elongation at maximum load owing to molecular compatibility but had lower strength and modulus. In order to improve the strength and modulus nano-alumina was added as a reinforcing agent in concentrations as 1, 3, 5 and 7 phr. The prepared nanocomposites were characterized for mechanical, thermal, rheological, morphological and electrical properties. The 5 phr nano-alumina loaded PVC/Hytrel blend had optimal improvement in its strength values, but above that concentration nano-alumina started forming aggregates which is evident from scanning electron micrographs. Tensile strength and tensile modulus were found to have increased by about 20% and 97% respectively; whereas elongation at maximum load decreased by 50%, indicating the effect of nano-alumina as reinforcing agent in the PVC/Hytrel system. The onset degradation temperature, viscosity, surface resistivity and volume resistivity increased whereas degradation weight loss (%) decreased with increase in nano-alumina concentration in PVC/Hytrel blend system.

Name of the student: Nidhi Shah
Degree: Ph.D (Tech)
Thesis title: Structure Property Behavior of Polymer Nanocomposites
Abstract: Polymer nanocomposites represent a new alternative to conventionally filled polymers. Because of their nanometer sizes and filler dispersion, nanocomposites exhibit fascinating properties when compared to the controlled polymers or their traditional composites. The study deals with synthesis of different nanoparticles, compatibilizers & their characterization. The synthesized nanoparticles will be used in different polymer matrix & compatibilizers will be used for uncompatibilized blends. Thus, the understanding of the links between the nanostructure, the flow properties of the melt and the solid-state properties is critical to the successful development of polymer nanocomposite products. The overall objective of this work is to try to quantify the structure-processing-property linkages in polymer nanocomposites.

Name of the student: Manoj Mali
Degree: Ph.D (Tech)
Thesis title: Development of Polymer Composites
Abstract: Nanotechnology has been dominating in automotive industry from last many years due to their enhanced properties against conventional materials. Nanocomposites are versatile in nature they are used in automotive Industry (Thermoplastic Vulcanize CASE). Thermoplastics vulcanizates are made by dynamic vulcanization of Polypropylene and Ethylene propylene diene monomer (EPDM). The use of nanocomposites in vehicle parts and system is expected to reduce weight and promote recycling. The weight and energy savings are the enhanced physical properties that nanocomposites offer, such as stiffness, strength and dimensional stability.
that set them apart from conventional fiber reinforced or mineral-filled materials. Property enhancement in nanocomposites occurs at very low nanoparticles loadings up to 5%.

Name of the student: Ajit Patil Degree: Ph.D (Tech)
Thesis title: Abstract: Polymers touch every aspect of our lives. Knowingly or unknowingly, every individual today relies on polymers to meet his needs. Though polymers are legion, sometimes they cannot fulfill the demand, depending on their properties. Improvements in polymers are tremendously important because they will widen the scope of application. There are two main approaches: construction of new molecules that are likely, from their molecular composition, to have the desired properties, and modification of properties of existing large-scale polymers.

The two predominant modes of polymer modifications are grafting and crosslinking. In other words, modification is essential to meet various challenges, as it is very difficult to get new polymers. The next generation awaits polymer modification as it opens up new possibilities. Among several Controlled Radical Polymerization (CRP) technologies, ATRP is the promising method due to its versatility. ATRP has emerged as one of the most powerful technique in polymer science for synthesis and modification. Polymers with predetermined molecular weight, narrow molecular weight distribution as well as desired composition and molecular architecture can be prepared by using ATRP.

Name of the student: Sneha Satavalekar Degree: Ph.D (Sci)
Thesis title: Abstract: Synthesis of polymeric materials using renewable resources

Abstract: Plastizzers like di-ethyl hexy l phthalate (DEHP), di octyl phthalate (DOP) are important additives in application of PVC. Some hazardous properties of them restrict their use in medical devices and children toys etc. Replacement of these plastizzers with heterocyclic diesters can act as alternative for these materials. Also diesters of long chain diols of oils can be treated as alternative diester system for plasticizer of PVC. Their final implementation has to be checked by mechanical and rheological studies.

Name of the student: Aarti More Degree: Ph.D (Tech)
Thesis title: Chemical modification of silane, polyetheramide, epoxy based resins and its application as industrial coatings

Abstract: Resin is one of the four main ingredients of paint on which various coatings properties are depend. In industrial coatings few of the popular resins are epoxy, polyurethane, silicone, acrylic etc. The modification of these conventional resins is carried out in some cases to overcome the drawbacks or in some cases to incorporate certain properties into coatings. Modification can be carried for various purposes and by various routes such as for flame retardant coating, for antimicrobial coatings, modification with hyperbranched polymer, modification with inorganic materials, Modification with specific monomers having certain groups present in it. With such modifications one or more properties can be incorporated into coating simultaneously hence coating can be used for high performance application.

Name of the student: Ganesh Anil Phalak Degree: Ph.D (Tech)
Thesis title: Abstract: Shellac is a natural resin obtained from insects has been used over many centuries for wide range of applications. Earlier in nineteenth century it was used in furniture coating. Afterwards this resin used in electrical, food, medical, printing ink etc. Now a day because of its biodegradable property it is used in Coating application. In this research work, colour of shellac improved by bleaching process, because it is very difficult to used dark brown colour shellac in paint. This shellac resin modified with different types of resins.

Name of the student: Arijit Gadgel Degree: M.Tech
Thesis title: Depolymerization and degradation of polymer in solution

Abstract: A new trend of degradation has been very useful for many purposes, which holds the waste utilization, properties enhancement of other material and deriving utility products from waste materials. In this work PVC (Polyvinyl Chloride) was partially dechlorinated and degraded by solvolysis recycling. The dechlorination of the PVC with ethylene glycol were obtained at a temperature of 1900°C followed with the ultrasonic degradation. Dechlorination avoid the HCl formation whereas the ultrasonication cause the chain scission. Study of depolymerization of product done by means of solvation recycling using ultrasonic energy, precipitation method and catalyst action in the solution.

Name of the student: Pooja Gawal Degree: M.Tech
Thesis title: Abstract: Synthesis of polymers from bio based resources is a big step towards ensuring sustainability.

Karanja oil, with their chemical versatility and economic viability is perfect resource. Polyetheramides from this oil, having excellent Chemical, mechanical and adhesion properties promise to have variety of applications in both, the field of coatings and adhesives.

Name of the student: Pradnya Rane Degree: M.Tech
Thesis title: Abstract: Over the last several decades, the process of recycling polymer waste has been attracting the attention of many scientists working on this issue. Polymer recycling is very important to reduce the ever increasing volumes of polymer waste coming from many sources and to generate value-added materials by converting them into valuable materials. Poly(ethylene terephthalate) (PET) occupies the top of the list of polymers to be recycled due to its easy recycling by different ways, which, in accordance, give variable products that can be introduced as starting ingredients for the synthesis of many other polymers. PET can be recycled by hydrolysis, acidolysis, alkaliolysis, aminolysis, alcoholysis and glycolysis. In this study aminolysis is carried out with different amines like and monomers obtained utilized for various applications.

Name of the student: Swapnil Kokate Degree: M.Tech
Thesis title: Synthesis of Nano Silver and its application in Polymer

Abstract: Nanoparticles of various metals have bactericidal effect. That effect can be used for the Purification of water. Nano particle of silver can kill the bacteria such as E-coli, which are responsible for water borne diseases. If that nanoparticle is coated on polymers having high surface area can be used as water filters at very cheaper rates.

Name of the student: Parth Kapoor Degree: M.Tech
Thesis title: Synthesis and Modification of Inorganic-Organic Hybrid Polymers by Silanes and Polysiloxanes

Abstract: Solid gel technology is coming up as a promising option for coatings and has...
gained a rapid and demanding growth during last decade. Organic/inorganic hybrid materials prepared by the sol–gel approach have rapidly become a fascinating new field of research in materials science. The explosion of activity in this area in the past decade has made tremendous progress in both the fundamental understanding of the sol–gel process and the development and applications of new organic/inorganic hybrid materials. Polymer-inorganic nanocomposite present an interesting approach to improve the separation properties of polymer material because they possess properties of both organic and inorganic such as good permeability, selectivity, mechanical strength, and thermal and chemical stability. Composite material derived by combining the sol–gel approach and organic polymers synthesis of hybrid material for coating application are the main focus area of this research.

Guide: Professor Dr. A. S. Sabnis 
Name of the student: Mukesh Kathalewar 
Course: Ph.D (Tech.) 
Project Title: Synthesis of sustainable functional materials for coating applications 
Abstract: The synthesis of new platform chemicals that are based on renewable resources has been accepted as a strategy to contribute to sustainable development due to the anticipated depletion of fossil oil reserves and rising oil prices. Cardanol which is separated by double vacuum distillation of Cashew nut shell liquid contains a characteristic long aliphatic alky chain at the meta position of phenolic ring that confers attractive properties such as good processability and high solubility in organic solvents and also influences many chemical transformations introducing novel functionalities. Some recent studies report its application in preparation of phenolics, epoxy, vinyl ester resins, phenalkamines etc. In this project we have developed multifunctional epoxy resins, silicone containing epoxy resin, polyols and used them as coating component. The cyclic carbonate derived from cardanol derivative was used to prepare non-isocyanate polyurethane (NIPU) and Hybrid-NIPU coatings. Amido-amines from cardanol based on thiol chemistry and the polymeric phenalkamines were used as epoxy curing agent.

Name of the student: Vandana Jandar 
Course: Ph.D (Tech.) 
Project Title: Studies in Depolymerization of Polymer Wastes for Coating Applications 
Abstract: Polyethylene terephthalate (PET) and Polyurethane (PU) foam are the most commonly recyclable polymers gives an excellent opportunity to yield novel oligomeric or monomeric materials by chemical depolymerization processes. Further these recycled products having variety of functionalities can be utilized for partial or complete replacement of raw materials for synthesis of various resin chemistries for coating applications.

In this project our aim is to investigate the depolymerization of polymeric materials like Polyethylene terephthalate (PET) and Polyurethane (PU) foam using various glycols with varying functionalities and non conventional amines by chemical recycling processes using conventional heating, microwave and high energy radiations assisted processes. Further we intend to study process optimization & modification for better efficiency of processes and reaction products. Finally, we propose to utilize these recycled materials for preparation of novel functional polymers through various chemistries for their application in coatings. The properties obtained of these various coatings would be studied as a function of type and structure of the glycol or amine used. The protocol developed through this project would establish a method for reuse and recycle the polymeric wastes with value addition.

Name of the student: Dinesh Balgude 
Course: Ph.D (Tech.) 
Project Title: Modification of Renewable resources for coating application 
Abstract: Considering tremendously increasing environmental regulations and dramatic price fluctuation of fossil resources, exploration of naturally available material can be the obvious option to develop various chemistries for modern coating industry. The aim of the proposed work is to replace the petroleum derived feed stock with CNSL(a renewable resource) for polymer/ resin synthesis as well to develop water based formulations based on modified CNSL to replace the organic solvents used in coating formulations. The applications in water based system involve development of chemistries such as alkyl, polyurethane dispersion, emulsion etc. with improved performance. Further, we propose one-pot process for dispersion less synthesis of various types of water based coatings via sol–gel chemistry. The synthesized coating will have pigments chemically bonded with the respective chemistry which would help to enhanced performance properties.

Name of the student: Nikitha Mhadeswar 
Course: M.Tech 
Project Title: Studies in functional monomers for emulsion polymerization 
Abstract: The study aims to investigate the effect of various monomers on properties of emulsion for coating applications. In this project, two monomers based on acrylate and acetate were used and their effect in conventional emulsions were studied. Both the monomers were incorporated in various amounts and their effect on % conversion, emulsion stability, particle size and overall film properties were investigated.

Guide: Professor P.A. Mahanwar 
Name of the student: Samarth Nikesh Bhaskkarrao 
Degree: M.Tech 
Thesis title: Synthesis of phthalate free plasticizer using Soyabean oil & Linseed oil via green chemistry and its application for PVC particulate composites 
Abstract: PVC plasticized with Di-Octyl Phthalate (DOP) is widely used polymer in industry. Phthalate based plasticizers are hazardous for human health, hence their used has been banned. Research is going on to find out alternative plasticizers for this application. The project deals with synthesis of green plasticizer via Epoxidation of soyabean oil and Linseed oil and their modified derivatives. This modified oil (SBO/LO) is used for plasticization of PVC and fly ash composite with varying amount of DOP.

The Plasticized PVC will be characterized for Fourier transform infrared spectroscopy (FTIR), Optical microscopy (OM), X-ray diffraction (XRD), thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC).

Name of the student: Kelkar Sunder Tukaram 
Degree: Ph.D (Sci.) 
Thesis title: Synthesis of Poly lactic acid (PLA) from renewable resources 
Abstract: Poly(L-Lactic acid), (PLA) is a biodegradable, biocompatible and compostable polyester, which has a bright future as an environmentally friendly thermoplastic.PLA finds promising applications in packaging, consumer goods, fibres and in biomedicine because of its excellent mechanical properties compatibility, transparency and biodegradability. This polymer can replace the conventional polymer used for packaging of food material like disposable containers, cups ,plates which
are mostly prepared from polystyrene foam, polyethylene bags etc. as these polymers degrades very slowly they produce large amount of the solid waste, which is the growing threat for world. The limitation in use of the PLA as alternative for conventional polymer is its cost. In order to make these polymers cheaper and to minimize its dependency for latex, alternative monomer on fossil resources, lactic acid should be prepared from renewable resources. LAC can currently be produced either by chemical synthesis or by fermentation from biomass, and the latter one is prevailing.

In present work we are trying to get lactic acid from renewable biomass like mango kernels and tamarind seeds, which can be used for producing poly lactic acid. It will reduce the cost of the raw material and also provide new and cheap agro waste as raw material for lactic acid production.

Modification of PLA to get better properties by co polymerization with PU, blending of other polymers and natural fibres in commercial PLA is also studied.

Name of the student: Gaikwad Pravin Ramesh
Degree: PhD (Tech.)
Abstract: Fiber reinforced polymer (FRP) composites are becoming very popular due to their ease of fabrication, economy and superior mechanical properties. Particularly fiber reinforcement as Micro and Nano scale in thermoplastic polymer matrix offer advantages in numerous engineering applications. Natural fibers (NF) have recently given more attention to researchers, engineers and scientists as an alternative reinforcement as FRP composites. Nowadays, these NF fibers are exploited as a replacement for the conventional fiber such as glass, aramid and carbon due to their low cost, fairly good mechanical properties, high strength to weight ratio, non-abrasive, ecofriendly and biodegradability characteristics. Electrospinning has been recognized as an efficient technique for the fabrication of polymer nanofibers. Our main aim of this research work is to study the effect of Natural and Synthetic fibers on the properties of High Density Polyethylene (HDPE) and Polypropylene (PP) reinforced composites. These chapped Polyethylene Terephthalate (PET) and Henequen (NF) microfibers without treatment and with surface treatment using coupling agent as VinylTrimethaOxialane (VTMO) as well as Glycidoxy functional methoxy silane (GPTS) are being used as reinforcement in polymer matrix and to be characterized for overall properties of FRP composites. PET electrospun nanofibers are also to be added in HDPE/PP polymer matrix and to be characterized accordingly.
Name of the student: Vijay Lal Kapse
Degree: M.Tech
Thesis title: Radiation Processing of Polyolefin blends and composites for automobile application
Abstract: Polyolefins are playing very important role in automobile sector for several years. To use this polymer blends or composite in automobile applications numbers of modifications are necessary in existing polymers for improved performance. Radiation processing by Electron beam, Gamma Rays & X-rays of polymers has been used for many years for modification of polymers. The aim of the current research work is to develop radiation process-able blends and composite of polyolefin for automobile applications.
The project deals with formation of blend and composites of polyolefin (LDPE, LLDPE, HDPE & PP) and EPDM with different loading of TPR fillers & mineral fillers (CaCO3) and radiation processing of formed blends & composites for different radiation dose, followed by mechanical testing, DSC, TGA and XRD analysis.
Name of the student: Vinayak Mahadeo Kamble
Degree: M.Tech
Abstract: The consumption of the plastic materials is growing due to their versatile properties (relatively low cost, light weight and durability) in various applications (packaging, electrical and electronics, agriculture and health care). Therefore, plastic waste amount continuously increases in municipal and industrial waste, creates a large burden on environment because of both contamination and area required to land-filling the waste. The recycling of waste plastics has attracted much interest as an alternative method for their disposal and management over the last few decades. As plastic comprise the calorific value to that of fuel, so the recovery of the fuel like product is an effective method of recycling. Basically pyrolysis is used for production of fuel but the amount of energy require to cracking is high enough. Considering radiation technology, had ability to alter the structure of polymeric materials (cross-linking, Grafting and degradation) can be efficiently applicable for recycling of plastic waste. So the combination of both radiation technology and pyrolysis become an alternative method for conversion of fuel from plastic waste. This research work gives an idea about the alternate method for recovery valuable product from the plastic waste at low energy consumption by using radiation processing.
Guide: Professor V.V.Shetukde
Name of the student: Akash A. Dongre
Degree: M.Tech
Thesis title: Synthesis and study of acrylate copolymers used as viscosity index improvers and pour point depressant for different base stocks.
Abstract: Polymeric additives were synthesized as a viscosity index improvers and pour point depressant for different base stocks, these additives synthesizes by homo polymerization of Cetly acrylate and copolymerization of Cetly acrylate with Styrene, Maleic anhydride and Methyl methacrylate (MMA). The structure of the prepared compound was confirmed by I.R Spectroscopy. The molecular weight of the prepared Homopolymer and copolymer was determined by gel permeation chromatography (GPC). Viscosity was determine by using Cone and Plate Rheometer. The efficiency of the prepared compounds as a viscosity index improvers and pour point depressant was investigated were investigated by ASTM D 2270 – 04 and ASTM D-97.
Name of the student: Rakhi Sonkusare
Degree: M.Tech
Thesis title: Study of synthesis and characterization of polyurethamide resin from renewable raw materials and its applications.
Abstract: Vegetable oil based adhesive emerged as an environmentally friendly substitute for petrochemical-based materials. Linseed oil and the blend of linseed oil and moringa oleifera seed oil based adhesive have been studied extensively and compare their properties. Most of the research work on moringa oleifera seed oil has explored its applications in pharmaceutical field. This work representing new area of application of moringa oil seed oil for polymeric resin, in which we attempted to synthesize seed oil based poly(urethane fatty amides) adhesive. Polylol was prepared by hydroxilation and alcoholysis to further react with isocyanate to form adhesives resin. Polylol and polyurethane analysis was performed using spectroscopic techniques, such as FTIR and 1 H NMR, GPC, TGA. Shear strength tests with oil-based adhesives of solid wood and plywood were studied and compared. The overall resistance of the chemical properties of oil-based polyurethane adhesives in response to hot water, acid, and alkali was studied and compared.

Name of the student: Sushil Vijay Patil
Degree: M.Tech
Abstract: Industrial applications such as chimneys, Automotive silencers, Boilers, Exhausts where normal operating temperature exceeds above 300- 400OC, at this high temperature general industrial paint does not stand satisfactory and needs a special development of paint which can sustain this high temperature successfully. In the market scenario presently silicone based heat resistant paints are available up to 600 - 7000OC, but their cost is too high. Therefore it is proposed to prepare the paint which can sustain this temperature successfully at lower cost.
This study will present an overview of the development
of the silicone-epoxy systems which offer heat and corrosion resistance. Silicone resin is blended with epoxy, acrylic and MF resin at various compositions having pigmentation like aluminum paste, carbon black and TiO2. Paint will be characterized for Heat resistances, Corrosion resistance, Solvent resistance, Chemical resistances, and Mechanical properties. The heat and corrosion resistances have been evaluated by using electrochemical impedance spectroscopy (EIS) and scanning electron microscopy (SEM).

Name of the student: Alpesh U. Vala
Degree: M.Tech
Thesis title: Synthesis and Characterization of Polyesteramide

Abstract: New aromatic Poly(Ester Amide) (PEA) synthesis from 4-Amino Benzoic Acid (PABA), Hydroxy benzoic acid and some aliphatic compounds. These monomers carry out Direct Polycondensation reaction in reaction mixers with Diphenylchlorophosphate/Phosphorus oxychloride as an activating agent, in solvent system Dimethylformamide (DMF). This method gives Poly (Ester Amide) of different morphology with fairly high average molecular weight, Glass transition temperature and degradation temperature. This polymer has ester, amide and aromatic groups on their chemical structure which are of a degradable character and provide good thermal and mechanical properties. This yield polymer will characterize by different methods like FTIR Spectroscopy (Functional group analysis), X-Ray Scattering (Nature of material), Differential Scanning Calorimeter & Thermo Gravimetric Analysis (Thermal properties), Gel Permeation Chromatography (Molecular Weight), Parallel Plate Rheometer (Viscoelastic behavior) and Nuclear Magnetic Resonance (Polymer Structure & Impurities). This polymer has ester, amide and aromatic groups on their chemical structure which are of a degradable character and provide good thermal and mechanical properties. This polymer will have expected applications in biomedical application, LCP Polymers and other engineering applications etc.

MAJOR ACCOMPLISHMENTS:
Department Selected for getting DST-FIST Development Grant
Pioneered Technology of interfolic compatibilization in polymers.
Published 42 International peer-reviewed research papers in the journal of international repute and attended three international conferences at abroad.

PHOTO GALLERY
PROFESSOR R.N.JAGTAP RESEARCH GROUP

From Left to Right: 1st Row – Nivedita Nandanwar, Ruchita Mapuskar, Prof. R.N. Jagtap, Stuti Shukla, Neha Golhar; 2nd Row- Nitin Rahangdale, Chinmay Kulkarni, Mukesh Chauhan, Nakul Bhutad, Santosh Waghamre, Junaid Parker ; 3rd Row – Umesh Tekale, Darshil Shah, Shubham Kharat, Amba Das, Linchon Mehta, Pratiket Bamane

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From left to right- Vandana Jamdar, Sonali Rakhade, Pranavbalaji, Kunal Wazarkar, Anup Patil, Tushar Chaudhary, Dinesh Balgude, Indrajit Bramhecha