

A composite image featuring laboratory glassware and chemical structures. On the left, a 200 ml beaker and a 125 ml Erlenmeyer flask are visible. On the right, a round-bottom flask contains a yellow liquid. Overlaid on the right side are several chemical structures, including a benzene ring with multiple hydroxyl groups and a chain with an amine group and a methyl group.

POLYMERUPDATE ACADEMY

EDUCATIONEM RESPONSUM EST

Polymer Additives & Compounding Part 1:

Fundamental of Polymer Additives

Digital Training Conducted by
Dr. Prashant Gupta
B Tech. M. E. PGD. – CTM. Ph.D.

Address:

1001/1002, Lodha Supremus,
Opp 'The World Towers' Senapati Bapat Marg,
Lower Parel (West), Mumbai – 400013,
Tel: (91-22) 61772000 (25 Lines)

INDEX

1. Introduction to Polymer Additives
2. Fillers & Its Classification
3. Stabilizers
4. Colorants
5. Processing Aids

Summary

The global plastic additives market is projected to grow from \$51.04 billion in 2021 to \$75.20 billion in 2028 at a CAGR of 5.7% in forecast period, 2021-2028. The market growth is a virtue of increase in the polymer usage for applications that they weren't used in the past. They have been increasingly used for use in automotive, packaging, electrical and electronics, pharmaceutical and agriculture industry.

Although polymers are high molecular weight materials, they have chemical reaction properties similar to those of small molecules. It means that a range of different factors, including thermal conditions, stress cracking, or the diffusion of chemical additives, can alter the molecular structure of a polymer, which in turn has an effect on the fundamental properties, of most polymeric materials. Also, not every material has properties similar to the intended end use. Can you imagine a flexible and tough material such as polypropylene being used for varying applications such as packaging, medical, construction, electrical, electronics, automotive, white goods, chemicals, etc.?

The versatility that it offers is an important aspect, but the role of various additives that are incorporated to tailor make PP compounds for varying requirements of temperature, stress, time, heat, humidity and many more such factors is critical for such materials. The same goes for polyester and nylon as well, wherein we see them made into fibre, films, rigid and tough automotive/electrical & electronic parts, etc.

The requirements for achieving stabilization and/or functional effects in polymeric products in order to make them durable, achieve the desired properties, and make them suitable for use in advanced applications have significantly increased. The course provides an insight into the broad topic of polymer additives use, their need, and the way they are incorporated into the polymer compound formulations. We shall look at introduction to additives and compounding; fillers; stabilizers, colorants and process aids in a systematic form.

Lecture 1: Introduction to additives

Lecture 1 covers, the introduction of the course, polymer compounding and its ingredients, various additives used for polymers along with its classification.

Lecture 2: Fillers and its classification

Lecture 2 covers, fillers, its addition criteria, its classification along with properties and applications of various fillers such as jute, coir, hemp, glass fibres, carbon fibres, Kevlar fibres, polymeric fibres, wood, calcium carbonate, talc, wollastonite, and clay.

Lecture 3: Stabilizers

Lecture 3 covers, basics of environmental stability and degradation, polymer degradation chemistry, effect of various environmental agents such as heat, light, ozone, etc., effect of various stabilizers on polymers such as antioxidants, heat stabilizers, antiozonants and UV guards along with the determination of UV stability.

Lecture 4: Colorants

Lecture 4 covers, basics of color and its attributes, coloration methodology in plastics, role/function of plastic colorants, basics of colorants and their classification, requirements of pigments for plastics application, masterbatches and its production, along with color assessment during QC.

Lecture 5: Processing aids

Lecture 5 covers, role of processing aids in polymer processing, their effects in specific polymers, their classification, along with plasticizers and lubricants in great detail.

Who this course is for?

- Any aspiring technologist who wants to enter the polymer compounding industry.
- Quality Control/ Quality Assurance/R & D technicians from the compounding industry (associated industries)
- Marketing/Sales executives inclusive of dealers and distributors who would want to gain a competitive edge over other suppliers in convincing their customers with technical knowhow about the additives/polymers that they do business in.
- All levels of management (first line, middle and top) for personnel involved in some technical role in polymer compounding industry.

Who this course is for?

- You will learn about the various additives used in polymers and their functional use.
- The characteristics of additives in polymers added to achieve the desired properties in the final material/compound.
- The classification of additives based on various categories.
- You will learn about various fillers, their origin and their classification.
- Also, You will learn about various stabilizers, colorants and process aids used for polymer modification



Dr. Prashant Gupta

B Tech. M. E. PGD. – CTM. Ph. D.

Born on June 6th, 1987, Dr. Gupta is a Polymer Technologist and has obtained his Masters, Post Graduate Diploma and Ph. D. from Institute of Chemical Technology, Mumbai. With virtue of his excellence in PGD-CTM course, Dr. Gupta has been awarded with a Gold Medal for securing top merit in the course.

Dr. Gupta has 5.5 years of academic experience (teaching/research) along with Industrial Research & Development experience in managerial positions for around 3.5 years in polymer compounding, testing, processing, and composites. Dr. Gupta has more than 20 publications to his credit in peer reviewed journals and books with high impact international (Elsevier, Wiley, Springer, Taylor & Francis etc.) publishers.

His areas of expertise and teaching include testing and quality control, polymer additives and compounding, polymer processing technology, polymer recycling and waste management, biodegradable and oxo-degradable plastics for packaging, use of information and communication technology for effective teaching learning, pedagogy related to teaching-learning, artificial intelligence in teaching learning, content creation for virtual laboratory, its development and applications.

Dr. Gupta has offered his expertise in the form of technical presentations at more than 20 international and prestigious national conferences/events across the globe some of which include EUROTEC-France, ANTEC-Mumbai, ICERP-Hyderabad, PPS-Mumbai, APM-Lucknow, APA-Chandigarh, Rangotsav-Mumbai, AMAI-Ahmedabad, etc. and won several awards for best paper, poster, project etc. Dr. Gupta has also been recognized as a certified developer, mentor, and reviewer for Virtual Labs, Mumbai an initiative of IIT M, IIT D and IIT K under MHRD, India.

Work Experience:

Organization Name: Maharashtra Institute of Technology

Tenure: 19th Sep 2016 onwards

Assistant Professor-Plastics and Polymer Engineering Dept. (UGC Approved) Junior Scientist, MIT-Center for Advanced Materials Research and Technology

Organization Name: Loxim Industries Ltd.

Tenure: 1st Sep 2015 – 16th Sep 2016

HOD and Manager: R & D/Quality Control

Management and Customer Representative-ISO-TS 16949

Organization Name : Crest Composites and Plastics Pvt. Ltd,

Ahmedabad Tenure: 21st Apr 14 –31st Aug 15

Assistant Manager, (R & D) Application Development

THANK YOU

PREPARED & CONDUCTED BY

DR. PRASHANT GUPTA

B Tech. M. E. PGD. – CTM. Ph. D

ADDRESS:

1001/1002, Lodha Supremus,
Opp 'The World Towers' Senapati Bapat Marg, Lower Parel
(West),
Mumbai – 400013,
Tel: (91-22) 61772000 (25 Lines)