

# Additives and rheology of polymer processing

Andreas Thürmer and Ekaterina Troussard

SIBUR | PolyLab Webinar, 19.08.2021

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## Overview

- General Polymer Properties
- Characterization of Polymer Melts  
(Viscoelastic properties / Rheology)
- Processing Technology and Processing Window
- Extrusion Technologies
- Injection Molding
- Processing Aids

SIBUR | PolyLab Webinar - BASF Plastic Additives - 19 August 2021

Internal

**BASF**

## World major thermoplastic resins breakdown

World Capacities 2015 (Million metric ton)



# Formulation Additives By Basf

**Anna Wypych, George Wypych**



## **Formulation Additives By Basf:**

*Polymers for Personal Care Products and Cosmetics* Xian Jun Loh, 2016-07-14 All aspects of the personal care industry will be comprehensively discussed in *Polymers for Personal Care Products and Cosmetics* including biological targets safety issues and the legal and regulatory aspects of this large industry There will be a broad overview of cosmetic ingredients vehicles and finished products as well as coverage of the main methodologies for microbiology safety and efficacy testing The reader will be provided with a solid background of the fundamentals of the area before being brought up to date on the future of this field along with discussion of the latest materials trends and future perspectives Written by a World renowned expert in the area the book will provide a unique look into this fast developing industry from interviews carried out with key experts in industry and academia The advantages and disadvantages of the technologies involved in the development of these materials will be highlighted providing a balanced and thorough review of the current state of the art research This book will appeal to researchers academics and students working in polymer and materials chemistry particularly those with an interest in personal care products

**Smart Manufacturing** Masoud Soroush, Michael Baldea, Thomas F. Edgar, 2020-08-04

Research efforts in the past decade have led to considerable advances in the concepts and methods of smart manufacturing *Smart Manufacturing Applications and Case Studies* includes information about the key applications of these new methods as well as practitioners accounts of real life applications and case studies Written by thought leaders in the field from around the world *Smart Manufacturing Applications and Case Studies* is essential reading for graduate students researchers process engineers and managers It is complemented by a companion book titled *Smart Manufacturing Concepts and Methods* which describes smart manufacturing methods in detail Includes examples of applications of smart manufacturing in process industries Provides a thorough overview of the subject and practical examples of applications through well researched case studies Offers insights and accounts of first hand experiences to motivate further implementations of the key concepts of smart manufacturing

Proceedings of the 10th International Conference on Electrorheological Fluids and Magnetorheological Suspensions Faramarz Gordaninejad, 2007 ERMR 2006 included invited speakers technical presentations poster presentations and a student paper competition At the conference banquet Dr David Carlson of Lord Corporation addressed the conference attendees and gave a stirring speech on the history of ER and MR fluids as well as current and future applications A unique feature of the ERMR Conferences is that they comprehensively cover issues ranging from physics to chemistry to engineering applications of ER and MR materials held in a general session to enhance the interaction between the scientists and engineers The sessions in ERMR 2006 were organized based into two Symposia a Materials and b Applications Topics covered in the Materials Symposium included mechanisms preparation and characterization of ER and MR materials Topics covered in the Applications Symposium included ER and MR devices control systems system integration and applications This structure was implemented in order to enable interaction between attending scientists and engineers in

both the Materials Symposium and the Applications Symposium and to enhance the free flow of ideas and the potential collaborative research opportunities

Sample Chapter s Chapter 1 Transient Behavior of Electrorheological Fluids in Shear Flow 471 KB Contents The Physical Mechanism to Reduce Viscosity of Liquid Suspensions R Tao Polar Molecular Type Electrorheological Fluids K Lu et al Yield Stress in Ferrofluids H Shahnazian The Effect of Dwell Time on the Rheological Behavior of MR Fluids M Ahmadian The Methods of Measuring Shear Stress of Polar Molecule Dominated ER Fluids R Shen et al Electrosensitive Lubricants E V Korobko et al Study on Characteristics of an Electrorheological Fluid Coupling Y Meng et al On the Control of a MR Torque Transfer Device M H Elahinia et al Comparison of ERF Clutch Designs D J Ellam et al Examination of Throughflow in a Radial ERF Clutch S M Chen et al Two Layered Magnetic Fluid Sloshing in a Rectangular Container S Yoshida et al Design of the High Performance MR Brake and Its Characteristics T Kikuchi et al and other papers

Readership Mechanical engineers electrical engineers physicists chemists chemical engineers and materials scientists

**Electrorheological Fluids And Magnetorheological Suspensions - Proceedings Of The 10th International Conference On Ermr 2006** Faramarz Gordaninejad,Olivia Graeve,Alan Fuchs,David York,2007-10-17 ERMR 2006 included invited speakers technical presentations poster presentations and a student paper competition At the conference banquet Dr David Carlson of Lord Corporation addressed the conference attendees and gave a stirring speech on the history of ER and MR fluids as well as current and future applications A unique feature of the ERMR Conferences is that they comprehensively cover issues ranging from physics to chemistry to engineering applications of ER and MR materials held in a general session to enhance the interaction between the scientists and engineers The sessions in ERMR 2006 were organized based into two Symposia a Materials and b Applications Topics covered in the Materials Symposium included mechanisms preparation and characterization of ER and MR materials Topics covered in the Applications Symposium included ER and MR devices control systems system integration and applications This structure was implemented in order to enable interaction between attending scientists and engineers in both the Materials Symposium and the Applications Symposium and to enhance the free flow of ideas and the potential collaborative research opportunities

**Pressure-Sensitive Formulation** Istvan

Benedek,2020-06-07 Growing interest in the formulation of pressure sensitive adhesives as described in the first edition of this book Pressure Sensitive Formulation VSP 2000 required a new enlarged edition including the design of pressure sensitive adhesives as a separate volume Developments in the understanding of pressure sensitivity were necessary to use macromolecular chemistry for pressure sensitive design Such developments include polymer physics and contact mechanics Progress in coating technology especially in in line coating and synthesis opened new ways for the design of pressure sensitive adhesives and products as well Actually pressure sensitive products with and without adhesives compete requiring a broad variety of material formulations and the corresponding manufacturing technology The first volume of the book examines the theoretical aspects of pressure sensitive design based on macromolecular chemistry macromolecular physics

rheology and contact mechanics The second volume describes the practical aspects of pressure sensitive design and formulation related to product application The advances in the various domains are described by specialists     **Databook of Antiblocking, Release, and Slip Additives** Anna Wypych,2021-01-26 Databook of Antiblocking Release and Slip Additives Second Edition contains detailed information on over 300 important additives for polymers including additives that are used to minimize adhesion aid separation and enhance processing and end applications for polymers Each additive is presented with data in the following categories General Information Physical Properties Health and Safety Ecological Properties and Use and Performance Data fields covered include state odor color autoignition temperature probability of biodegradation and much more Recommendations are given for specific products processing methods and mold materials and an assessment is given for each additive s features and benefits Contains the most extensive data available on a large number of antiblocking release and slip additives for polymers Features 130 data fields for each additive that are divided into General Information Physical Properties Health and Safety Ecological Properties and Use and Performance Includes an assessment of the benefits and properties of each additive recommended dosages and processing methods     Databook of Rheological Additives Anna Wypych,George Wypych,2022-03-15 Rheological additives are commonly applied in a wide range of industries and this databook provides readers with information on over 300 organic and inorganic additives This information is presented in individual tables for each product whether commercial or generic The data are divided into five groups those being General Information Physical Properties Health and Safety Ecological Properties and Use Performance The following information is included in each section General Information name CAS EC IUPAC name common name common synonyms acronym biobased cellulose functionality charge degree of substitution empirical formula chemical structure molecular mass RTECS number chemical category product class product composition moisture content and solids content Physical Properties state odor color bulk density density specific gravity relative density boiling point melting point pour point decomposition temperature glass transition temperature refractive index vapor pressure vapor density volume resistivity relative permittivity ash content pH viscosity rheological behavior absolute viscosity surface tension hydration time solubility in solvents solubility in water the heat of combustion the heat of decomposition specific heat thermal conductivity Henry s law constant particle size and volatility Health Safety NFPA classification HMIS classification OSHA hazard class UN Risk phrases UN Safety phrases UN NA class DOT class ADR RIC class ICAO IATA class IMDG class packaging group shipping name food approvals autoignition temperature self accelerating decomposition temperature flash point TLV ACGIH NIOSH and OSHA maximum exposure concentration IDLH animal testing oral rat rabbit dermal mouse oral guinea pig dermal rat dermal rat inhalation mouse inhalation ingestion skin irritation eye irritation inhalation first aid eye skin and inhalation carcinogenicity IARC NTP OSHA ACGIH and mutagenicity Ecological Properties biological oxygen demand chemical oxygen demand theoretical oxygen demand biodegradation probability aquatic toxicity algae Rainbow trout Sheepshead minnow

Fathead minnow and *Daphnia magna* and partition coefficient Use Performance manufacturer product feature recommended for polymers recommended for products outstanding properties compatibility limitations a typical reason for use processing methods the concentration used storage temperature and food approval Provides readers with information on over 300 organic and inorganic additives presented in individual tables for each product Data featured are divided into five groups General Information Physical Properties Health and Safety Ecological Properties and Use Performance Information highlighted for each additive includes name common name chemical structure state odor color boiling melting points rheological behavior OSHA hazard class ingestion skin eye irritation first aid carcinogenicity biodegradation probability manufacturer product feature recommended for polymers recommended for products outstanding properties compatibility limitations a typical reason for use processing methods storage temperature and food approval

*Formulation of Microbial Biopesticides* H.D. Burges, 2012-12-06 Sound formulation is a vital aspect of microbial products used to protect plants from pests and diseases and to improve plant performance Formulation of Microbial Biopesticides is an in depth treatment of this vitally important subject Written by experts and carefully edited this important title brings together a huge wealth of information for the first time within the covers of one book The book is broadly divided into five sections covering principles of formulation organisms with peroral and contact modes of action organisms with the power of search and future trends Each section contains comprehensive chapters written by internationally acknowledged experts in the areas covered the book also includes three very useful appendices cataloguing formulation additives spray application criteria and terminology This outstanding book is a vitally important reference work for anyone involved in the formulation of microbial biopesticides and should find a place on the shelves of agriculture and plant scientists microbiologists and entomologists working in academic and commercial agrochemical situations and in the libraries of all research establishments and companies where this exciting subject is researched studied or taught

**Databook of Surface Modification Additives** George Wypych, 2023-02-07 Databook of Surface Modification Additives Second Edition contains data on 10 groups of additives including anti scratch and mar preventing additives additives for surface tension reduction and wetting hydrophobization additives gloss enhancement and surface matting additives additives for formation of tack free surface and tackifiers and stain inhibiting additives The information on each is divided into five sections including General Information Physical chemical Properties Health and Safety Ecological Properties and Use and Performance This data is provided for approximately 360 of the most important surface modification additives produced and used today This databook will be an extremely useful resource for engineers researchers and technicians interested in using additives to modify and improve the surface properties of materials Provides detailed up to date essential data on 10 groups of additives Covers general information physical chemical properties health and safety ecological properties and use and performance Includes recommendations for specific products applications processing methods and the concentrations used

*Additives for*

*Polyolefins* Michael Tolinski, 2009-09-22 This book focuses on the polyolefin additives that are currently important in the plastics industry alongside new additives of increasing interest such as nanofillers and environmentally sustainable materials. As much as possible each chapter emphasizes the performance of the additives in the polymer and the value each relevant additive brings to polypropylene or polyethylene. Where possible similar additives are compared by capability and relative cost. With major sections for each additive function this book provides a highly practical guide for engineers and scientists creating and using polyolefin compounds who will find in this book a wealth of detail and practical guidance. This unique resource will enable them to make practical decisions about the use of the various additives fillers and reinforcements specific to this family of materials.

**ABOUT THE AUTHOR** Michael Tolinski is a freelance writer and a lecturer at the University of Michigan's College of Engineering. He is a frequent contributor to *Plastics Engineering and Manufacturing Engineering*. Structured to make it easy for the reader to find solutions for specific property requirements. Contains a number of short case studies about companies that have used or developed a particular additive to achieve a desired result. Covers environmental resistance, mechanical property enhancement, appearance enhancement, processing aids, and other modifications of form and function.

**Handbook of Industrial Chemical Additives** Michael Ash, 1991 Contains over 18 000 entries for chemical trademark products currently sold throughout the world.

*Sustainable Value Creation in the Fine and Speciality Chemicals Industry* R. Rajagopal, 2014-06-12 The global fine and speciality chemicals industry is a vital segment within the chemical value chain catering to a multitude of societal and industrial needs. Regulatory sustainability and consumer forces have been constantly shaping the business fundamentals of this industry. Developing value creation strategies which embed economic, environmental, and social sustainability components will need a comprehensive assessment of business, scientific, and technological challenges facing the industry. *Sustainable Value Creation in the Fine and Speciality Chemicals Industry* assesses sustainable value creation options against the backdrop of global mega trends that are defining the present and future course of the industry. It discusses innovative strategies in feedstocks, R & D, technology, manufacturing, resource management, and the supply chain, as well as the significance of the bio-based chemical economy in enabling sustainable value creation in the fine and speciality chemicals industry. Topics covered include Transformation in the fine and speciality chemicals business, Sustainable management, evolution, transitions, and tools, Research and technology directions, Resource optimization strategies, Bio-based chemicals, specialities, and polymers, Sustainable practices in the fine and speciality chemicals industry, Sustainable value creation strategies.

*Sustainable Value Creation in the Fine and Speciality Chemicals Industry* presents a comprehensive overview of strategic options for sustainability management in the global fine and speciality chemicals industry. It will be a valuable resource for chemists and chemical engineers involved in the design and development of economically, environmentally, and socially sustainable practices for the future.

**Understanding Additives** Bodo Müller, 2019-09-11 This book covers everything about the mode of action, application, and possible side

effects of the most important coatings additives in a single volume presented in a textbook style It reflects the needs of practical work thus it enables the reader to rapidly gain a solid grounding in these critical yet complex constituents of all paint formulations It provides both an overview and in depth basic knowledge of the most important classes of additives The various types of damage eliminated or prevented by additives are vividly illustrated with colour photos An indispensable companion for formulators     ANTEC 2001 Society of Plastics Engineers. Technical Conference,2001     **Lubricant**

**Additives** Leslie R. Rudnick,2017-07-12 This indispensable book describes lubricant additives their synthesis chemistry and mode of action All important areas of application are covered detailing which lubricants are needed for a particular application Laboratory and field performance data for each application is provided and the design of cost effective environmentally friendly technologies is fully explored This edition includes new chapters on chlorohydrocarbons foaming chemistry and physics antifoams for nonaqueous lubricants hydrogenated styrene diene viscosity modifiers alkylated aromatics and the impact of REACH and GHS on the lubricant industry     Advances in Refining Catalysis Deniz Uner,2017-03-16 To meet changing market demands that have stringent emission standards and to ensure proper performance in refinery units evaluation of novel catalyst designs and results from material characterization and testing of catalysts are of crucial importance for refiners as well as for catalyst manufacturers This book highlights recent developments in the application of refinery catalysts in selected units such as fluid catalytic cracking FCC hydrogen production for hydroprocessing units hydrotreating hydrocracking and sustainable processing of biomass into biofuels

Biofuels for Aviation Christopher Chuck,2016-06-02 Biofuels for Aviation Feedstocks Technology and Implementation presents the issues surrounding the research and use of biofuels for aviation such as policy markets certification and performance requirements life cycle assessment and the economic and technical barriers to their full implementation Readers involved in bioenergy and aviation sectors research planning or policy making activities will benefit from this thorough overview The aviation industry s commitment to reducing GHG emissions along with increasing oil prices have sparked the need for renewable and affordable energy sources tailored to this sector s very specific needs As jet engines cannot be readily electrified turning to biofuels is the most viable option However aviation is a type of transportation for which traditional biofuels such as bioethanol and biodiesel do not fulfill key fuel requirements Therefore different solutions to this situation are being researched and tested around the globe which makes navigating this scenario particularly challenging This book guides readers through this intricate subject bringing them up to speed with its current status and future prospects both from the academic and the industry point of view Science and technology chapters delve into the technical aspects of the currently tested and the most promising technology in development as well as their respective feedstocks and the use of additives as a way of adapting them to meet certain specifications Conversion processes such as hydrotreatment synthetic biology pyrolysis hydrothermal liquefaction and Fisher Tropsch are explored and their results are



assessed for current and future viability Presents the current status of biofuels for the aviation sector including technologies that are currently in use and the most promising future technologies their production processes and viability Explains the requirements for certification and performance of aviation fuels and how that can be achieved by biofuels Explores the economic and policy issues as well as life cycle assessment a comparative techno economic analysis of promising technologies and a roadmap to the future Explores conversion processes such as hydrotreatment synthetic biology pyrolysis hydrothermal liquefaction and Fisher Tropsch

**Shreir's Corrosion**, 2009-02-27 This four volume reference work builds upon the success of past editions of Elsevier's Corrosion title by Shreir Jarman and Burstein covering the range of innovations and applications that have emerged in the years since its publication Developed in partnership with experts from the Corrosion and Protection Centre at the University of Manchester Shreir's Corrosion meets the research and productivity needs of engineers consultants and researchers alike Incorporates coverage of all aspects of the corrosion phenomenon from the science behind corrosion of metallic and non metallic materials in liquids and gases to the management of corrosion in specific industries and applications Features cutting edge topics such as medical applications metal matrix composites and corrosion modeling Covers the benefits and limitations of techniques from scanning probes to electrochemical noise and impedance spectroscopy

**Proceedings of the Estonian Academy of Sciences, Chemistry**, 2006-06 Blowing Agents for Polyurethane Foams S. N. Singh, 2002 This review discusses the legal requirements and property specifications for blowing agents in different applications Each type of blowing agent is described Key environmental and physical properties are listed together with advantages and limitations Foams are described by types and by applications An additional indexed section containing several hundred abstracts from the Polymer Library gives useful references for further reading

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## **Table of Contents Formulation Additives By Basf**

1. Understanding the eBook Formulation Additives By Basf
  - The Rise of Digital Reading Formulation Additives By Basf
  - Advantages of eBooks Over Traditional Books
2. Identifying Formulation Additives By Basf
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Formulation Additives By Basf
  - User-Friendly Interface
4. Exploring eBook Recommendations from Formulation Additives By Basf
  - Personalized Recommendations
  - Formulation Additives By Basf User Reviews and Ratings
  - Formulation Additives By Basf and Bestseller Lists
5. Accessing Formulation Additives By Basf Free and Paid eBooks

- Formulation Additives By Basf Public Domain eBooks
- Formulation Additives By Basf eBook Subscription Services
- Formulation Additives By Basf Budget-Friendly Options
- 6. Navigating Formulation Additives By Basf eBook Formats
  - ePub, PDF, MOBI, and More
  - Formulation Additives By Basf Compatibility with Devices
  - Formulation Additives By Basf Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Formulation Additives By Basf
  - Highlighting and Note-Taking Formulation Additives By Basf
  - Interactive Elements Formulation Additives By Basf
- 8. Staying Engaged with Formulation Additives By Basf
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Formulation Additives By Basf
- 9. Balancing eBooks and Physical Books Formulation Additives By Basf
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Formulation Additives By Basf
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Formulation Additives By Basf
  - Setting Reading Goals Formulation Additives By Basf
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Formulation Additives By Basf
  - Fact-Checking eBook Content of Formulation Additives By Basf
  - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

#### 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

### **Formulation Additives By Basf Introduction**

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web feb 1 2011 delirium by lauren oliver release date feb 1 2011 oliver s artfully detailed prose reveals brick by brick the sturdy dramatic foundation of an initially implausible premise in her dystopian america love has been outlawed as the life threatening source of all discord

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web like love a single word a wispy thing a word no bigger or longer than an edge that s what it is an edge a razor it draws up through the center of your life cutting everything in two before and after the rest of the world falls away on either side lauren oliver delirium tags inspirational

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web jan 1 2011 delirium is a dystopian young adult novel written by lauren oliver published on january 1 2011 by harpercollins the story focuses on a young woman lena haloway who falls in love in a society where love is seen as a disease delirium is the first novel in a trilogy followed by pandemonium and requiem

**delirium summary supersummary** - Nov 09 2022

web written by lauren oliver in 2011 delirium is a young adult dystopian novel that takes place in a world where love is considered a disease and is thus surgically removed from a person s brain when they turn 18 the protagonist lena haloway

falls in love with a boy named alex warren and must navigate a world in which their love is forbidden

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web feb 3 2011 delirium delirium 1 lauren oliver delirium is the first in her dystopian trilogy it tells the story of a society where love has been considered a disease and everyone has to go through a special treatment on their eighteenth birthday to be cured of the illness

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