

METALLOCENES 2000

Markets, Technologies & Trends

Completed Fourth Quarter 2000

Polyolefins MT&T Series

- *Global Market Size & Growth Rates, By Region, By End Use*
- *Metallocene Technology Overview and Developments*
- *Metallocene Polyethylene, Elastomers and Polypropylene*
- *Metallocene Catalyst/Support Supplier Opportunities*
- *Global Process/Product Mapping of Major Players*
- *Major End Uses and End Users, Grades/Suppliers*
- *Impact Of Metallocenes on the Future Polyolefins Industry*
- *Impact of Mergers and Acquisitions*
- *Multiattribute Analysis of Metallocenes by Major End Uses*
- *Market/Technology Position of Major Suppliers*
- *Future Direction by End Use and Major Participants*
- *Strategic Recommendations by Region, By Type of Supplier, By Type of End Users and Future R&D Activities*

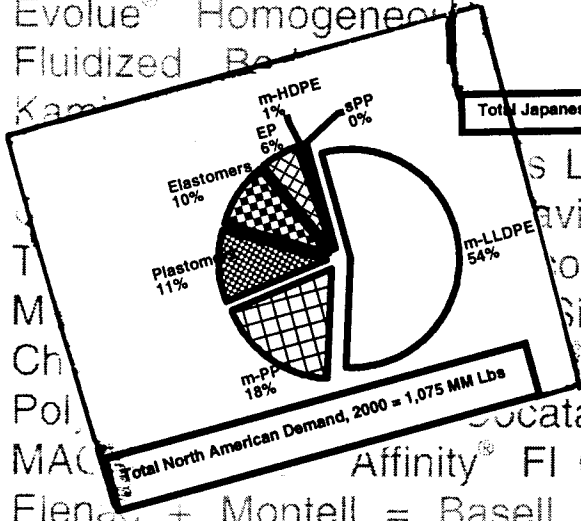
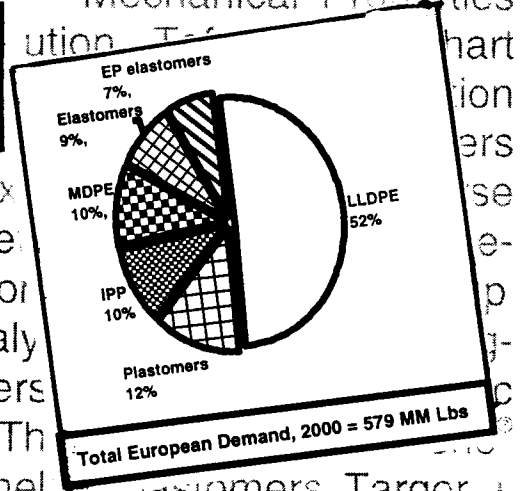
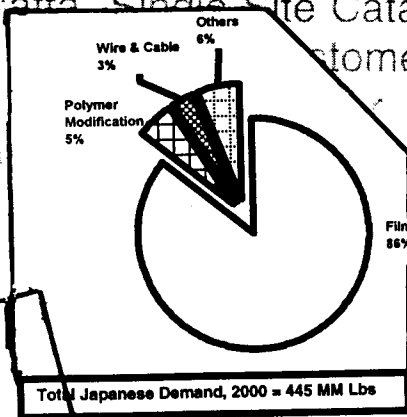


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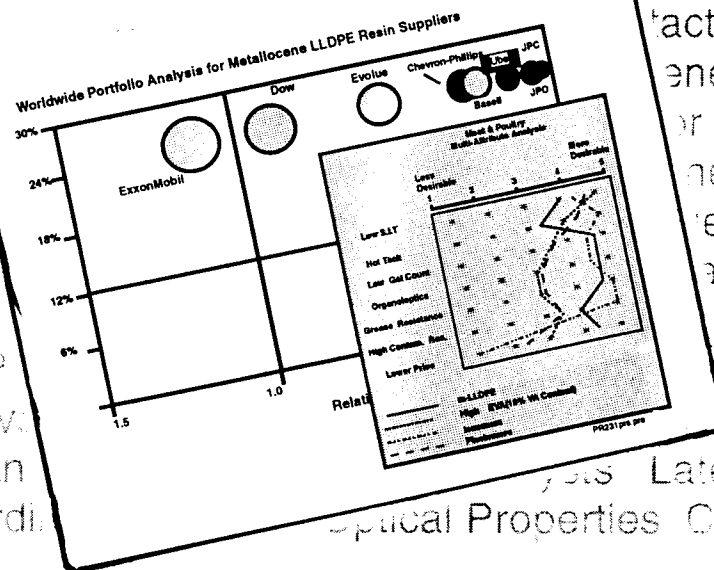
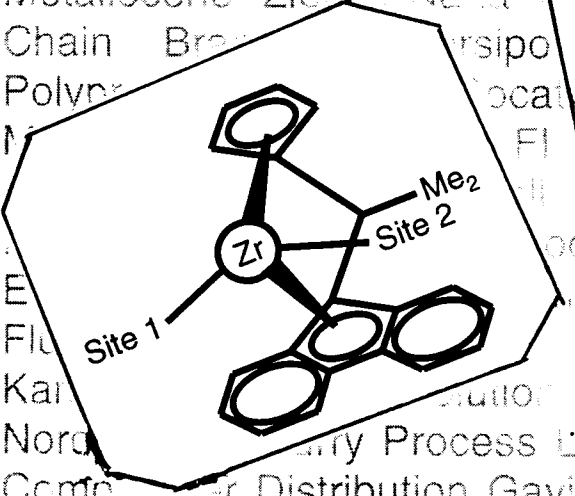
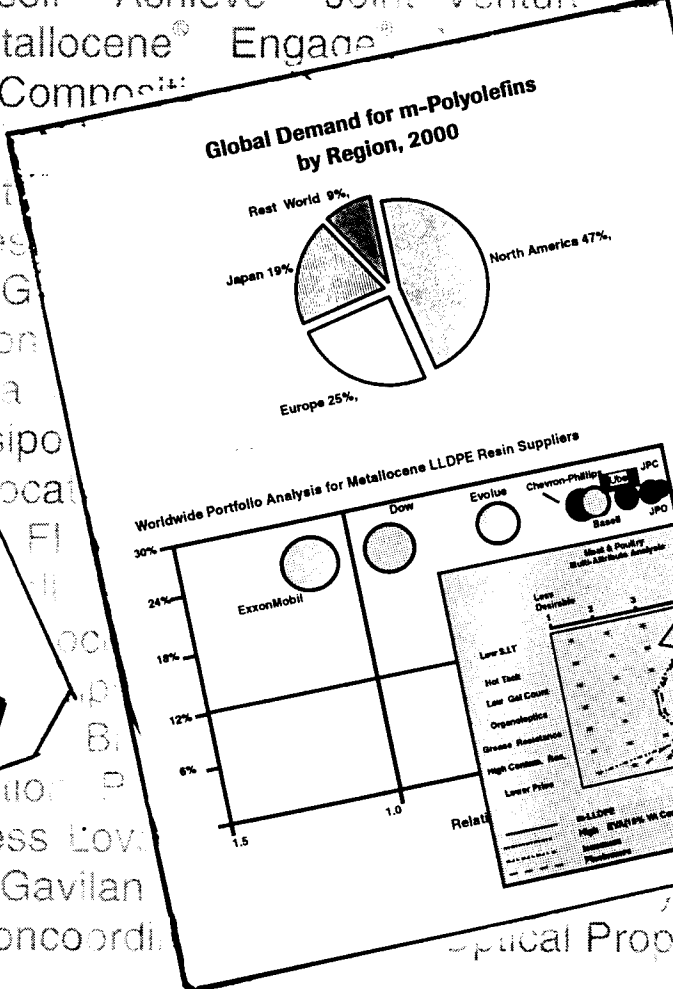
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GLOBAL METALLOCENE POLYOLEFINS & ELASTOMERS 2000 MARKETS, TECHNOLOGIES AND TRENDS

INTRODUCTION

In the early 90s ethylene-based copolymers manufactured using metallocene catalysts were commercialized by Exxon Chemical Company and The Dow Chemical Company. The metallocene catalysts employed were the culmination of intense development efforts by a number of companies and academic institutions over the previous 15 years. The period of the mid 90s served as technical and marketing proving grounds for (1) the plastomers and elastomers introduced initially by Exxon and Dow; (2) the metallocene-based LLDPEs introduced by Exxon and Dow plus other players such as Borealis, Elenac, Evolve, Japan Polychem Corporation, Japan Polyolefins, Mitsui Chemicals, Phillips, and Ube Industries, Ltd., and (3) the metallocene-based polypropylene lines introduced by Exxon, Targor, and Fina. DuPont Dow Elastomers introduced metallocene-based EP elastomers as well.

In the late 90s the polyolefins industry has witnessed the maturation of metallocene-based polyolefins, especially ethylene-based products. At the bottom of the density range, elastomers are competing against EPM, LDPE, EVA, flexible PVC, and other materials. The plastomers have been established as solid players in film markets, particularly in food packaging, where they compete against ionomers, EVA, and LLDPE. The m-LLDPEs offer a unique balance of mechanical and optical properties that film processors find particularly useful. Metallocene-based polypropylenes remain further back on the development curve, but they have become commercial and are seeing increased demand.

Chemical Market Resources, Inc., strongly believes that metallocene-based polyolefins will continue to grow at very robust rates, competing with incumbent conventional polyolefins as well as opening new markets for polyolefins. However their acceptance by the marketplace has proceeded at a pace slower than many had anticipated in the early days when these materials were introduced.

A TIMELY STRATEGIC STUDY

Chemical Market Resources, Inc., is offering a comprehensive study of the status of the global metallocene-polyolefins industry *circa* 2000, focusing on (1) the catalysts and polyolefins derived from them, (2) production technologies used to manufacture metallocene-based polyolefins, (3) the producers and soon-to-be producers of metallocene-based polyolefins, (4) the markets for these materials, (5) intermaterial competition among metallocene polyolefins, conventional polyolefins, and other polymers, (6) supply of and demand for metallocene-based polyolefins on a global basis, and (7) analysis of future trends in the industry.



Global Metallocene Polyolefins & Elastomers 2000, Markets, Technologies & Trends will benefit all participants in the global polyolefins industry including (1) polyolefins producers, (2) technology licensors, (3) producers and suppliers of metallocene complexes and catalyst components, and (4) major end users.

KEY ISSUES ADDRESSED

- *History of the development of metallocene catalysts beginning with the seminal work of Giulio Natta in the 50s*
- *Coverage of major metallocene and other single-site catalyst families, patent positions, and intellectual-property issues; assessment of current and future catalyst and polymer technologies*
- *Introduction to the major polyolefins production technologies that can accommodate metallocene catalysts*
- *Processability, optical, mechanical, and other properties of metallocene-based polyolefins and how they compare to incumbent polyolefins*
- *Key producers of metallocene catalysts, catalyst components, and metallocene-based polyolefins worldwide*
- *Assessment of worldwide joint-development programs in single-site catalyst technologies*
- *Current status and the future direction of metallocene polyolefin technology*
- *The impact of metallocene polyolefins on major end users and applications*
- *Outline of the global markets for metallocene-based polyolefins in terms of the impact of these materials on conventional polyolefins and other polymers*
- *Market and technology positioning of the major suppliers*
- *Evaluation of metallocene-based polyolefins in terms of performance and unmet needs*

APPROACH

The information, data, and conclusions of this analysis will be developed from sources in North America, Western Europe, Japan, and Rest of the World are based upon, but not limited to, the following methods:

- *Interviews with leading polyolefins and catalyst suppliers and end users*
- *Search, review, and interpretation of information from individual organizations, government sources, trade and industry groups, government agencies, published articles, and product promotional information*
- *Public-domain Information from the dozens of projects Chemical Market Resources, Inc., has undertaken over the past 5 years*
- *Information from our extensive, on-going coverage of the industry found in our publication, NEW GENERATION POLYOLEFINS – A Global Bimonthly Review (Call for a complementary Copy!)*
- *Thorough analysis by our highly talented group of engineers, scientists, and MBAs– our work is unparalleled in quality and depth.*



SUBSCRIPTION INFORMATION

The report was issued in the **FOURTH QUARTER of 2000**. Companies subscribing to the study are entitled to the purchase price of \$12,000. The subscription price includes an summary update in the second quarter of 2001 at no additional charge. Additional copies will be available for \$350 each.

PROJECT MANAGEMENT

As usual, this report will be a result of diligent efforts of our team members and is yet another shining example of our dedication to quality and thoroughness. Brief experience summaries of the project team members follow:

DR. WILLIAM D. VERNON, Vice President and General Manager is the project manager for the project. Bill obtained a B.A. in Chemistry from Rice University and a Ph.D. in Chemistry from Michigan State University. Bill spent 21 years in the chemical industry, initially as a research scientist at Stauffer Chemical Company, Dobbs Ferry, NY, then manager, director at Rexene, Odessa, TX, and finally as Vice President, Technology, for Paxon Polymer Company, Baton Rouge, LA. His expertise is in the areas of polyolefins manufacturing, catalysis, properties, processing, analysis, R&D program development, and intellectual asset assessments. For the last four years, Bill has been active in marketing and technology consulting for both polyolefins and catalysts for polyolefins.

DR. BALAJI B. SINGH, president of Chemical Market Resources, Inc., obtained a Ph.D. in Chemical Engineering from Texas A&M University and an M.B.A in Marketing Research and Strategic Planning from the Ohio State University. He has seven years of experience in the oil/chemical industry in process research, process economics and marketing research. Balaji has successfully completed over 500 proprietary studies, in high technology specialty products in various end use industry sectors for clients worldwide. Dr. Singh began closely following the development of metallocene-based polyolefins years before they were commercialized. Dr. Singh assisted most of the major organizations active in developing metallocene based products for specific applications.

MR. JEHANGIR (JR) IRANI Senior Project Manager, obtained his M.S. degree in Chemical Engineering from Texas A&M University. JR has several years of consulting experience in polyolefins production and process development. As a project manager, JR has successfully completed a number of projects involving technology evaluations and market research opportunity analysis for the vinyls, polyolefins, polyurethane, thermoplastic elastomers, and fabricated products for clients worldwide. He managed the multiclient studies in the areas of Polyolefin Foams, TPO/TPVs - Plastomers/Elastomers and Polypropylene Films.



**GLOBAL METALLOCENES
POLYOLEFINS & ELASTOMERS 2000**

Markets, Technologies & Trends

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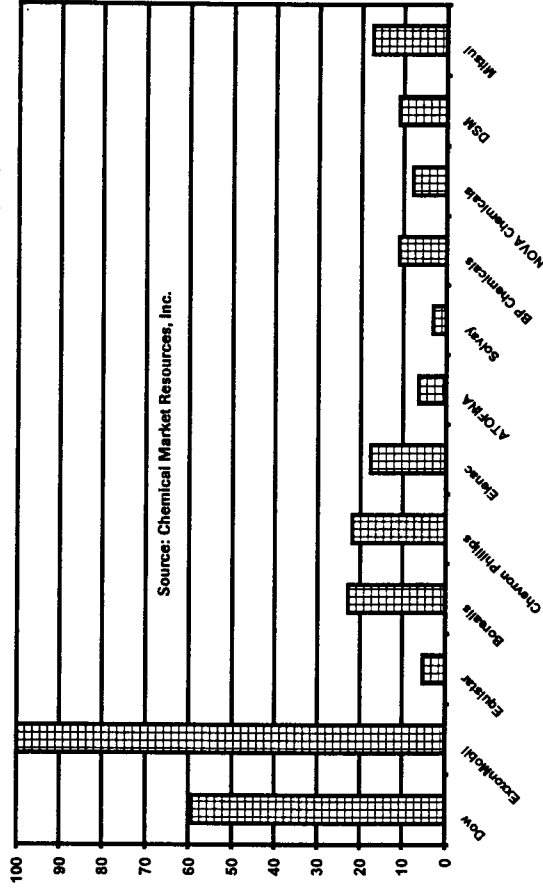


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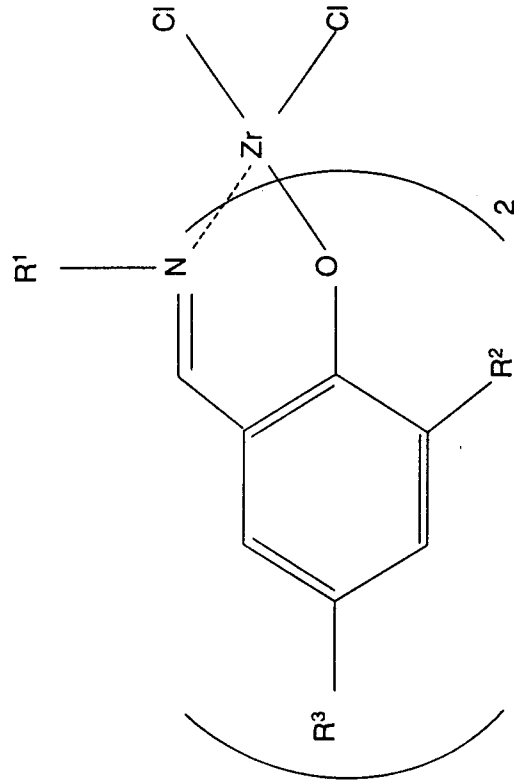
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Analysis of Metallocene Catalyst Technology Efforts-Polyethylene



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Basic Structure of Mitsui's FI Catalyst Precursor



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